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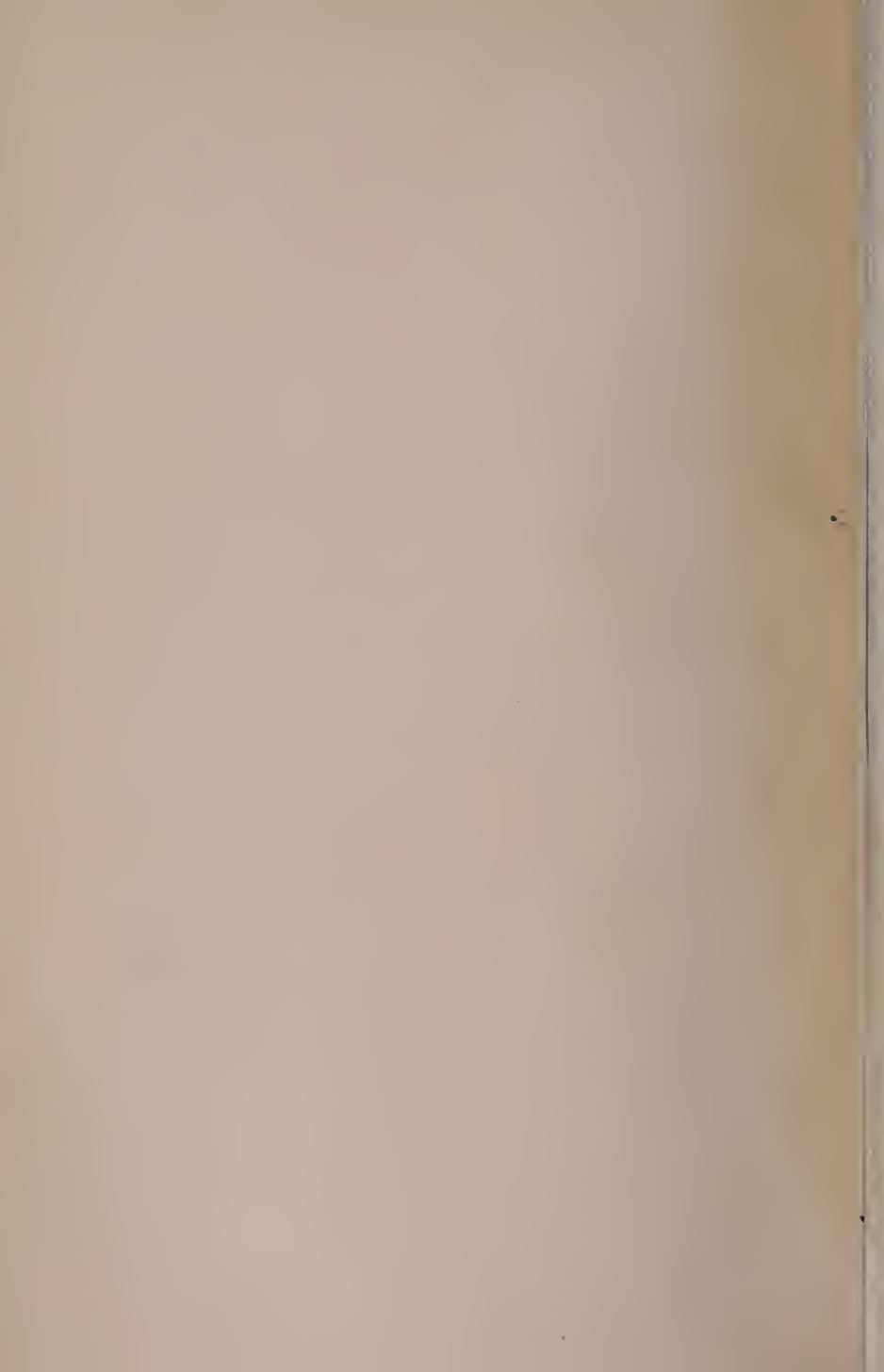
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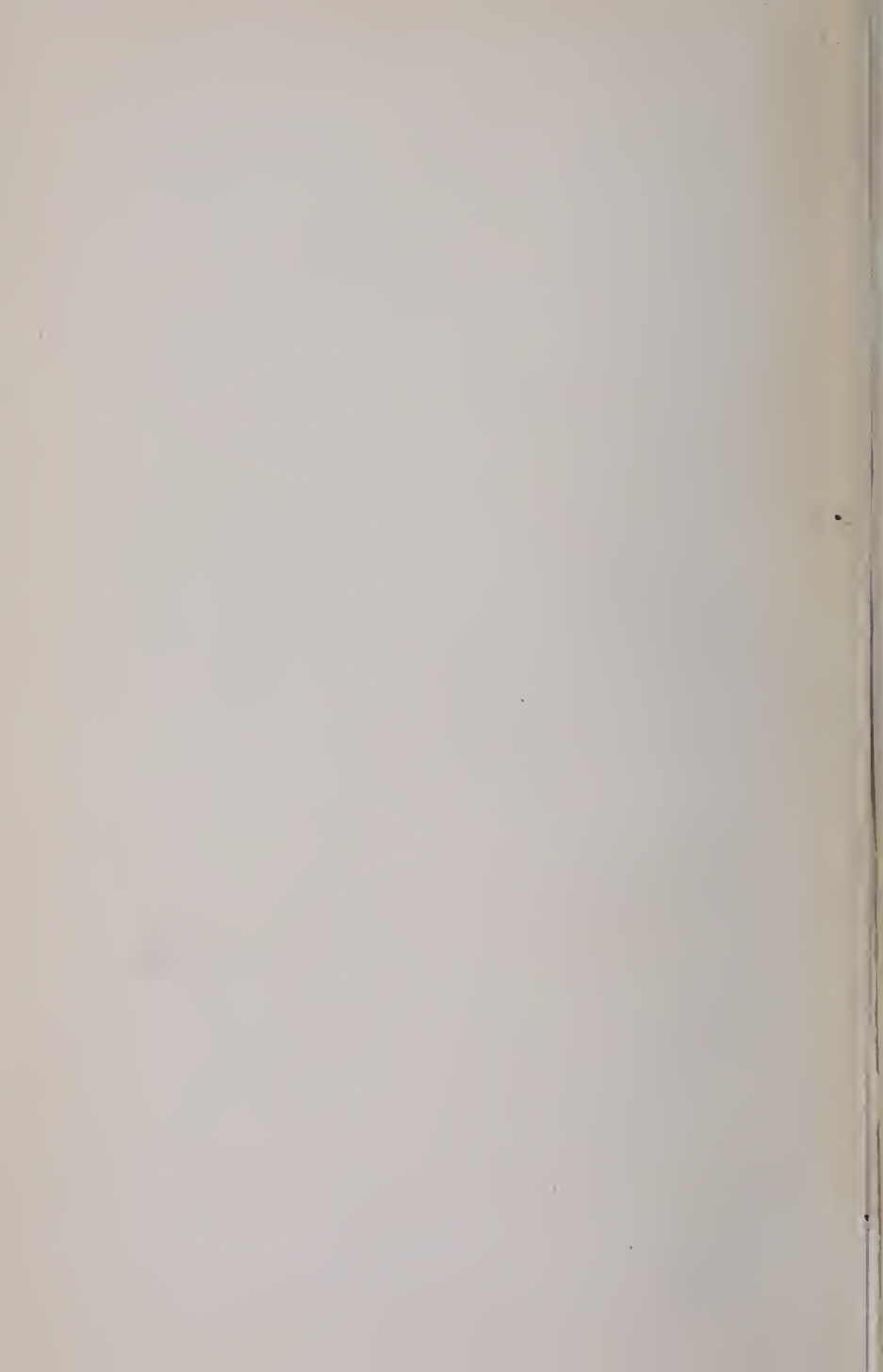






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JOURNAL  
OF THE  
ASIATIC SOCIETY OF BENGAL, ✓

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VOL. XVI.

PART II.—JULY TO DECEMBER, 1847.

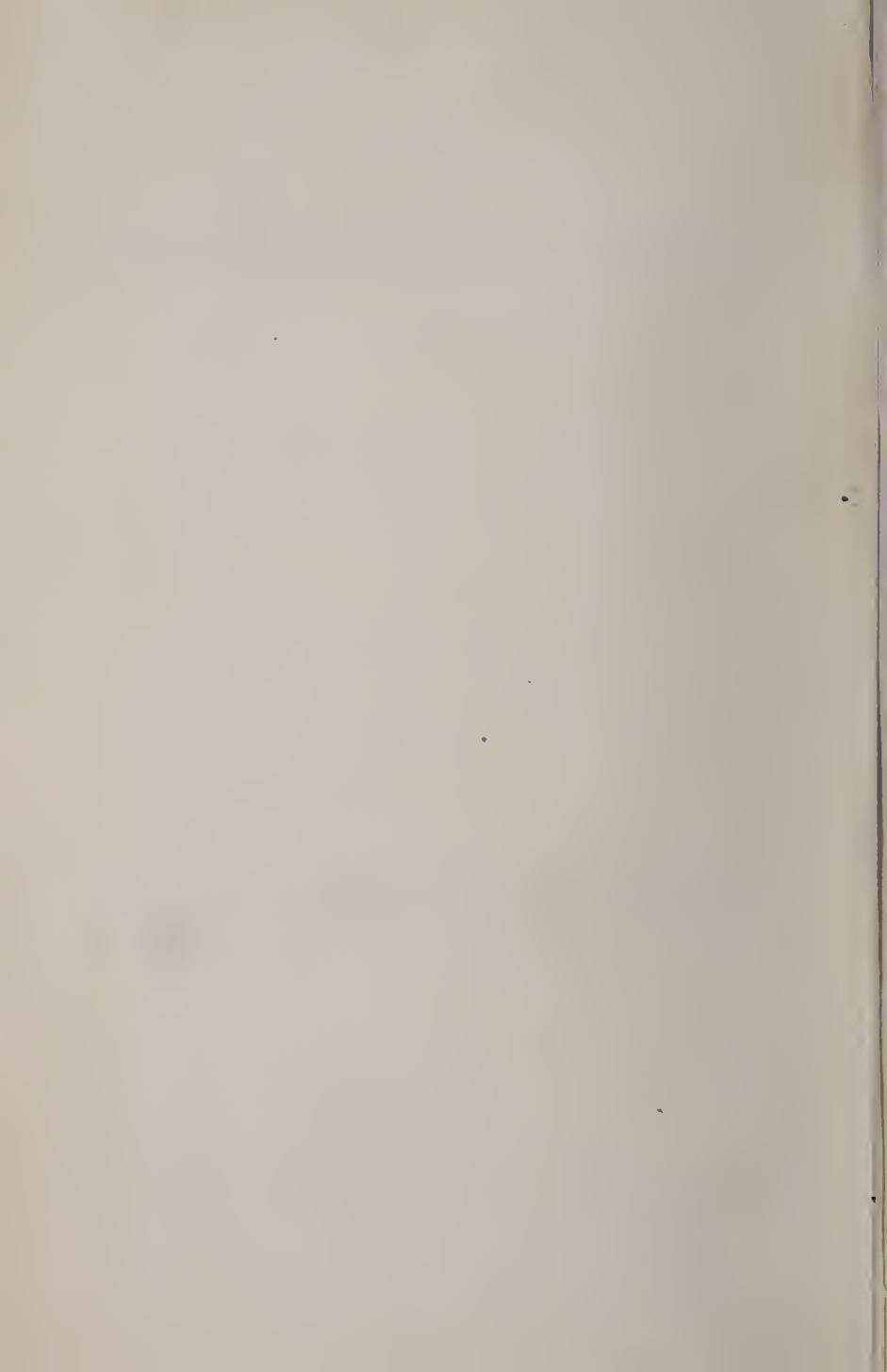
It will flourish, if naturalists, chemists, antiquaries, philologists, and men of science, in different parts of Asia will commit their observations to writing, and send them to the Asiatic Society at Calcutta. It will languish if such communications shall be long intermitted; and it will die away if they shall entirely cease."—SIR WM. JONES.

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1847.





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# ERRATA.

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*Page Line*

- 1153, 16, for 'Heptophyllum,' read 'Haplophyllum.'  
 1154, 8, for 'primula,' read 'pumilas.'  
 1162, 6, for 'trigoue,' read 'strigose.'  
 1164, 32, for 'tubes,' read 'tufts.'  
 1211, 24, for 'Zygophyllacæ,' read 'Zygophyllaceæ.'  
 1212, 2, for 'rubiscentia,' read 'rubescencia.'  
 —, 27, for 'sepili,' read 'sessili.'  
 —, 28, for 'instructo,' read 'instructo.'  
 —, 37, for 'tentibns,' read 'teretibus.'  
 1213, 5, for 'sepili,' read 'sessili.'  
 —, 18, for 'grassiusculus,' read 'crassiusculus.'  
 —, 24, for 'pauce floris,' read 'paucifloris.'  
 —, 28, for 'cupsulâ,' read 'capsulâ.'  
 —, 29, for 'canniculo,' read 'carunculo.'  
 —, 31, for 'Bothianâ,' read 'Rothianâ.'  
 1214, 7, for 'SPARTSIUM,' read 'SPARTIUM.'  
 —, 13, for 'bortus,' read 'tortus.'  
 —, 15, for 'l-spimum,' read 'l-spermum.'  
 —, 21, for 'utrimquc,' read 'utrinque.'  
 —, —, for 'serucies,' read 'sericcis.'  
 —, 22, for 'umcinalibus,' read 'terminalibus.'  
 —, 23, for 'vexille,' read 'vexillo.'  
 —, 24, for 'sericea,' read 'sericeo.'  
 —, —, for 'purpureâ,' read 'purpurco.'  
 —, 32, for 'camosis,' read 'carnosis.'

<i>Page</i>	<i>Line</i>	
1215,	9,	for 'Fl : ind,' read 'Bot : Journ :'
—,	12,	for 'di-spinuis,' read 'di-spermis.'
—,	22,	for '5-lineari,' read '5-linearia.'
—,	24,	for 'medis,' read 'medio.'
—,	25,	for '1-spermis,' read '1-spermus.'
—,	29,	for 'tentibus,' read 'teretibus.'
—,	31,	for 'scabrillis,' read 'scabrellis.'
1216,	15,	for 'SEMONIACIÆ,' read 'VERNONIACEÆ.'
—,	16,	for 'VEMONIA,' read 'Vernonia.'
—,	21,	for 'histellis,' read 'hirtellis.'
1217,	15,	for 'crassiuscule,' read 'crassiuscula.'
—,	20,	for 'uniformia,' read 'reneformia.'
—,	24,	for 'Doradanthera,' read 'Doratanthera.'
—,	27,	for 'tentibus,' read 'teretibus.'
1218,	11,	for '5-costabis,' read '5-costatis.'
1219,	34,	for 'Saccharum dissitiflorum,' read 'SACCHARUM DISSITI- FLORUM.'
—,	37,	for 'tentibus,' read 'teretibus.'
1226,	16,	for 'Here lived, &c. to 'rivals,' read 'Bhúmpála, the crest of the moral race of the moon whom no rivals could overcome, reigned here with righteousness and affa- bility.'
1228,	3,	for 'Wednesday,' read 'Thursday.'
—,	4,	after 'Vaishákha,' read '(when the moon was in the man- sion) of Rohini.'
—,	7,	after 'buildings,' read 'and columns.'
—,	18,	for 'five,' read 'ten.'
—,	20,	for 'Wednesday,' read 'Thursday.'



# JOURNAL

OF THE

# ASIATIC SOCIETY.

JULY, 1847.

## CATALOGUE OF REPTILES

*Inhabiting the MALAYAN PENINSULA and ISLANDS,*

*Collected or observed by THEODORE CANTOR, Esq. M. D., Bengal  
Medical Service.*

[Localities printed in Italics signify those from whence the animals of the Catalogue were obtained; in ordinary type those previously given by authors. The descriptions are in most cases taken from life; in the few in which it is expressly noted, shortly after death, in none from specimens preserved in spirits of wine.]

## CHELONIA.

FAM. ELODIDÆ, OR MARSH-TORTOISES, *Dum. and Bibr.*

SUB-FAM. CRYPTODERINÆ, *Dum. and Bibr.*

GEN. GEOEMYDA, *Gray.*

Head covered with thin continued skin; chin not bearded. Legs strong, not fringed behind. Toes 5-4, strong, short, free, covered above by a series of shields; claws short. Tail tapering; shell depressed, three-keeled; hinder edge strongly toothed. Sternum solid, broad truncated before, notched behind; gular plate linear, band-like, small; axillary and inguinal plates small.

GEOEMYDA SPINOSA, (Bell.)

SYN.—*Emys spinosa*, Bell apud Dum. and Bibr.

*Emys bispinosa*, Schlegel.

*Testudo emys*, Müller?

*Geoemyda spinosa*, Gray.

Shell oblong, subquadrate, keeled, flattened above, chestnut coloured, front and hinder edge strongly serrated; vertebral plates broad, first suburceolate; costal plates with a posterior, subsuperior areola, with a slight subconic tubercle; beneath yellow, brown rayed; *young* depress-

ed, pale brown, bluntly keeled, with a distinct spine in the areola of each discal plate.

HABIT.—*Pinang Hills.*

Sumatra.

Two individuals were observed by the Hon'ble Sir William Norris, late Recorder of H. M. Court of Judicature in the Straits of Malacca, on the Great Hill at Pinang, at a distance from water. The colour of the shell is a dirty brownish ochre, here and there with sooty rays, which numerous intersect the concave sternum. The keel, the marginal spines, and the costal tubercles are nearly obliterated, and the shell presents frequent marks of corrosion. The larger individual is of the following dimensions :—

Length of the head, .....	1 $\frac{5}{8}$ inch.
Ditto ditto neck, .....	1 $\frac{5}{8}$
Ditto ditto shell, .....	8
Ditto ditto tail, .....	1 $\frac{2}{8}$

A large tick was firmly adhering to the throat of one of these tortoises, the presence of which however does not indicate an exclusively terrestrial life, as one species at least of the *Riciniæ* (*Ixodes ophiophilus*, Müller?) occurs on aquatic as well as terrestrial serpents. The following are the characters of *Ixodes geoemydæ*. The short sucker is depressed, slightly widening towards the bifid apex, and encased by the palpi. Above, and at a short distance from the latter, are two minute rounded fossæ. The cephalic, tetragonal plate is of a reddish brown colour, with a yellow spot at the posterior angle. The oval body is dark pearl-coloured. On each side close to the articulation of the posterior leg appears a small rounded horny plate. The legs are reddish brown with a yellow spot at each of the joints, except the last. Swollen, as the tick appeared, it measured six-eighths of an inch in length; half an inch in breadth.

GEN. EMYS, *Brogiaart*.

Head moderate, covered with a thin hard skin; chin not bearded. Feet short, covered with scales; toes 5-4, strong, shielded above, webbed to the claws. Tail moderate. Shell depressed. Sternum solid, broad, truncated before, notched behind, affixed to the thorax by a bony symphysis, covered by the ends of the pectoral and abdominal plates; axillary and inguinal plates moderate, distinct.

A.—*Vertebral plates lozenge-shaped*.—Gray.

EMYS CRASSICOLLIS, Bell, MSS. apud Gray.

SYN.—*Emys crassicollis*, Bell, apud Dum. and Bibr.*Emys spengleri*, Var, Schlegel.

Shell ovate, oblong, rather convex, revolute on the sides and deeply toothed behind, black, slightly three-keeled; keels close; first vertebral plate elongate, six-sided; sternum flat, pale, and keeled on the sides; head and neck thick, black.

HABIT.—*Malayan Peninsula, Pinang.*

Sumatra, Java.

In Malayan individuals, numerous inhabiting rivulets and ponds in the valleys, the throat is whitish, and a small white spot appears on each side of the occiput. The vertebral keels and the lateral spines become obliterated with age. The largest individual observed was of the following dimensions:—

Length of the head, . . . . .	$1\frac{6}{8}$ inch.
Ditto ditto neck, . . . . .	$1\frac{6}{8}$
Ditto ditto shell, . . . . .	9
Ditto ditto tail, . . . . .	$1\frac{1}{8}$

It feeds upon frogs and also upon shell-fish and animal offal. Old Malay women, who may be seen after every heavy fall of rain, spending hours, rod in hand, over the overflowing ditches, out of which their huts rise, are often ludicrously disappointed on perceiving this tortoise on the hook.

B.—*Vertebral plates broad, six-sided*. Gray.

EMYS PLATYNOTA,—Gray.

SYN.—“*Kátong*” of the Malays of the Peninsula.

Shell ovate, convex, yellow dotted, with the centre of the back quite flat, as if truncated; shields striated, nucleus central; vertebral shields broader than long, six-sided, 5th keeled; the front and hinder margin strongly toothed; sternum flat, truncated before; and slightly notched behind; tail moderate, tapering.

HABIT.—*Malayan Peninsula, Pinang.*

Sumatra.

Mr. Gray's description refers to the young animal, of which the length of the shell is given in *Proceed. Zoolog. Soc.* 1834. P. 54, as 9 inches. The representation of *Emys platynota* in *Illust. Ind.*

*Zool.*, from its size, and the strongly toothed flat front and hind margins of the shell, also appears to be a young animal. The penultimate, the fourth, vertebral shield is represented as divided in two pieces, which if so in the original, must be accidental, as normally the fourth vertebral shield is six-sided, and in size nearly equalling the preceding. The nuclei of the costal shields are more central than represented in the plate.

In the living adult animal the head, neck, shell, tail and feet are of a dirty yellowish, or greenish brown, which becomes paler on the sternum. The nuclei of the vertebral shields are slightly raised. The costal shields are depressed, their sides sloping towards the nuclei, thus forming as it were very shallow hexagonal basins. The front and hind margins are broadly revolute, their toothed appearance worn off. The sternum is slightly concave in the centre. The largest individual was of the following dimensions :

Length of the head, . . . . .	0 feet	3 inch.
Ditto ditto neck, . . . . .	0	3
Ditto ditto shell, . . . . .	1	$7\frac{4}{8}$
Ditto ditto tail, . . . . .	0	$2\frac{4}{8}$

It lived in my garden at Pinang upwards of a twelvemonth, apparently without food, and it was never observed to enter a tank. The shell bears deep white marks of corrosion, in appearance like that observed in *Testacea* inhabiting stagnant water. The animal suffered itself to be touched with impunity, never offering to scratch or bite. This tortoise inhabits the valleys, but is apparently not numerous.

*EMYS TRIVITTATA*, Duméril and Bibron.

Shell smooth, entire, subcordiform, arched, yellowish green, and with three broad longitudinal black bands ; jaws toothed.

HABIT.—*Malayan Peninsula, Pinang.*

Bengal.

It inhabits rivers and ponds on the Malayan Peninsula, but appears not to be numerous. In the Malayan adult animal there is a large black spot situated at the anterior, lower angle of the marginal shields, there is no trace of a keel in the centre of the vertebral shields, and the very minute nuchal shield is triangular, with the apex towards the vertebral shields. The shield is rather oval than subcordiform. The sternum is slightly arched, of a pale whitish yellow. The largest individual was of the following dimensions :

Length of the head, . . . . .	0 feet	3 inch.
Ditto ditto neck, . . . . .	0	$2\frac{1}{8}$
Ditto ditto shell, . . . . .	1	6
Ditto ditto tail, . . . . .	0	$2\frac{3}{8}$

GEN. CISTUDO, *Fleming*.

Head moderate, covered with a thin hard continued skin. Toes 5-4, webbed to the claws, web thick, with a small intermediate lobe between the claws. Tail short. Shell convex, ovate, or hemispherical. Sternum broad, rounded before and behind, completely closing the cavity of the thorax, affixed to it by a ligamentous, symphysis, and divided by a cross suture between the pectoral and abdominal plates. Sternal shields twelve. Inguinal and axillary plates very small, but distinct. Marginal plates 23-27. Nuchal plate small or wanting.

CISTUDO AMBOINENSIS, (Daudin.)

SYN.—*Testudo amboinensis*, Daudin.

*Emys amboinensis*, and *couro*, Schweigger.

*Tortue à boîte d'Amboine*, Bose.

*Terrapene amboinensis*, Merrem.

*Kinosternon amboinense*, Bell.

*Cistuda amboinensis*, Gray.

*Terrapene couro*, Fitzinger.

*Emys couro*, apud Wagler.

*Terrapene bicolor*, Bell.

*Emys couro*, Var. Schlegel, apud Gray.

"Baning" of the Malays of the Peninsula.

HABIT.—*Malayan Peninsula, Singapore.*

Java, Amboina, Philippine Islands, Tenasserim provinces.

Shell hemispherical, slightly three-keeled, blackish, margin broad expanded, nuchal shield linear; sternum black and yellow-varied; animal blackish, varied with yellow, head dark with two broad yellow streaks on each side.

The dorsal keels become obsolete with age, and the margin of the shell, particularly the posterior part, becomes revolute. This species appears to be numerous in the valleys, in ponds, rivulets and paddy fields. It is very timid, withdrawing its head and limbs when handled, though it neither bites nor scratches. The largest individual observed was of the following dimensions.

Length of the head, . . . . .	2 inch.
Ditto ditto neck, . . . . .	$2\frac{1}{8}$
Ditto ditto shell, . . . . .	7
Ditto ditto tail, . . . . .	1

## GEN. TETRAONYX, Lesson.

Toes five; nails 4-4; sternum solid, broad with six pairs of shields; 25 marginal shields.

## TETRAONYX AFFINIS, N. S.

*Young.* Shell orbicular, its breadth exceeding its length; the back sharply keeled longitudinally, slightly arched, laterally depressed; costal shields with a tubercular nucleus at the posterior margin; greyish green olive, minutely spotted with brown; edge sharply toothed, pale greenish yellow. Sternum truncate in front, angularly indented behind, narrow, yellow; laterally keeled, compressed, pale yellowish green.

HABIT.—*Sea off Pinang.*

The outline of the shell and its composing shields strikingly resemble the young of *Cyclemys orbiculata*, Bell.\*

The nuchal shield (wanting in one individual,) is small, subrectangular or subtriangular, with the base directed backwards. The vertebral shields are strongly keeled, laterally sloping, hexagonal, broader than long, which however with the first is less the case than with the rest; the second, third and fourth are the broadest, and of nearly equal size; the fifth assumes a broadly truncate triangular shape. The costal shields are nearly all as broad as long; the first, second and third have each a tubercular nucleus in the centre of the posterior margin, the fourth is smooth, and a little smaller than the preceding. The first pair of marginal shields is truncate triangular, the second, and third subrectangular; the fourth sixth, and eighth pentagonal; the rest subrectangular. In all, the posterior external angle forms a more or less sharp spine, directed over the anterior external margin of the next shield. From the first to the sixth the shields gradually increase in size, the sixth being the largest and broadest, from which the following gradually decrease towards the twelfth pair, and their angular spines become obsolete. The sternum consists of two parts: one central, and two lateral, formed by the sterno-costal processes of the two central pairs, sharply sloping towards the marginal shields. The central part is longitudinally a little concave, narrowing towards both extremities, truncate in front, angularly in-

\* Syn. *Emys dentata*, Illust. Ind. Zoolog.—*Emys dhor*, Gray.—*Emys hasseltii*, Boie—*Emys spengleri*, Var. Schlegel.—*Cistudo diardui*, Dum. and Bibi.



dentated behind. The gular pair of shields is very short, broadly subtriangular with the posterior margin concave, curved backwards. The second, and fifth pairs are of nearly equal size, subquadrangular, their external margins forming a sharp ridge. The central part of the third and fourth pairs is subrectangular, broader than long, their margins forming a sharp ridge where they join the sterno-costal processes. The latter are of nearly equal size, longer than broad, their united length being less than one half of the central part of the sternum. The sixth pair is subrhomboidal, longer than broad. The axillary and inguinal pairs are large; the former subrhomboidal or lozeng-shaped, the latter subtriangular. The head is conic; the muzzle short pointed; the vertex irregularly wrinkled. On the temples, cheeks, and round the orbits, and the lower jaw appear some large polygonal scales. The occiput, angle of the mouth, and the rounded tympanum are covered with similar minute scales. The eyes are large, prominent; the iris silvery grey; the pupil round black. The nostrils are minute, round, horizontally pierced, close together at the apex of the muzzle. The jaws are minutely toothed; the upper has at the symphysis two larger teeth, between which fits a similar single one in the lower jaw, thus hermetically closing the mouth. The neck, the throat and the other soft parts are studded with minute tubercles, except the fore-arm, the posterior tarsal margin, and the back of the fingers and toes, which are covered with broad, but very short, polygonal scales. On the ulnar margin of the fore-arm are four to five large rounded flexible scales. The interdigital web is large and lax. The nails are strong, of nearly equal size, sharp, and arched. The conical tail reaches but little beyond the shell, with a longitudinal furrow behind the vent. The head, neck, throat and the limbs are of the same greyish green olive as the shell. The interdigital membrane is blackish, except the web connecting the fourth and fifth (nailless) toe, which is of a bright greenish yellow colour. Of three individuals observed, differing but little in size, the largest was of the following dimensions:

Length of the head, . . . . .	$0\frac{6}{8}$ inch.
Ditto ditto neck, . . . . .	$0\frac{3}{8}$
Ditto ditto shell, . . . . .	$2\frac{4}{8}$
Ditto ditto tail, . . . . .	$0\frac{4}{8}$
Greatest transverse diameter of the shell, . . . . .	$2\frac{6}{8}$

Two were at different times found in fishing stakes placed along the sea-shore of Pinang; a third was also taken out of the sea with a small hook, baited with a shrimp. The Malays assert that this tortoise also inhabits estuaries and rivers on the Peninsula, and that it grows to a considerable size. The young is very timid, withdrawing the head and extremities when touched, and thus it remained immoveable while a sketch was taken.

From the description of the young of *Tetraonyx lessonii*, Dum. and Bibr. given in *Erpétologie Générale*, Tome 2, p. 338, and from the plates of *Emys batagur* and *Emys baska*, in *Illustr. Ind. Zool.*, from B. Hamilton's MSS., the present appears to differ in too many particulars, to warrant the conclusion of its being the young of those or that species.\* The detailed description of the young will enable future observers, who may succeed in examining the adult, finally to decide the question.

FAM. POTAMIDA, OR RIVER-TORTOISES, *Dum. and Bibr.*

GEN. GYMNOPUS, *Dum. and Bibr.*

(*Trionyx*, Geoffroy.—*Aspidoneetes*, Wagler.—*Tyrse*, *Dogania*, *Chitra*, Gray.)

Shell cartilaginous in its circumference, very broad, flexible behind, and externally not bony; sternum too narrow behind completely to cover the extremities, when the animal withdraws them under the shell.

GYMNOPUS GANGETICUS, (Cuvier.)

SYN.—*Testudo ocellatus*, (Young.) }  
       *Testudo hurum*, } Buchan. Ham. MSS.  
       *Testudo chim*, (Adult.) }  
       *Trionyx gangeticus*, Cuvier.  
       *Trionyx hurum*, Gray.  
       *Trionyx hurum*, *Illustr. Ind. Zool.*  
       *Trionyx ocellatus*, *Illustr. Ind. Zool.* (Young.)  
       *Trionyx gangeticus*, Var. *Guerin.* (Young.)  
       *Gymnopus ocellatus*, *Dum. and Bibr.* (Young.)  
       *Gymnopus duvaucellii*, *Dum. and Bibr.*  
       *Tyrse gangetica*, Gray: *Catal.*

*Young.*—(*Testudo ocellatus*, B. Ham. MSS.) Head above pale olive with one large yellow spot between the eyes and a similar behind

\* M. M. Duméril and Bibron describe them as two distinct species; Mr. Gray is of opinion that they are identical.



each eye; neck, limbs and posterior margin of the shell dark olive with paler round spots; shell olive with black irregular lines, and 4 or 5 central ocelli, black in the centre, edged with red, round which a black ring; sternum pale whitish-olive.

*Testudo hurum*, B. Ham, MSS. is the transition state of the former, being about changing the livery. Head yellow olive, with irregular dark lines; shell light olive, vermiculated with blackish or dark olive. The four ocelli are present, but are altered in colours and shape: the centre, instead of being black, is like the rest of the surface, light olive, vermiculated with black; the red ring is changed to black, and the outer black one to light olive. The shape is changed from round to irregular oval.

*Adult.* (*Testudo chim*, B. Ham. MSS.) Dark olive-green, vermiculated, and spotted with light olive brown. Beneath greenish white.

**HABIT.**—*Malayan Peninsula, Pinang (Rivers and Sea-coast.)*

Rivers and Bay of Bengal.

It is of fierce habits, desperately defending itself by biting, emitting when excited a low, hoarse, cackling sound. At Pinang the present species appears to be far less numerous than the two following. The largest individual was of the following dimensions:

Length of the head, . . . . .	0 feet 4 inch.
Ditto ditto neck, . . . . .	0 4 $\frac{1}{8}$
Ditto ditto shell, . . . . .	1 11
Ditto ditto tail, . . . . .	0 5

#### GYMNOPUS CARTILAGINEA, (Boddaert.)

**SYN.**—*Young.*

*Testudo cartilaginea*, Boddaert.

*Testudo boddaertii*, Schneider.

*Testudo rostrata*, Thunberg?

*Testudo rostrata*, apud Schoepff, and Daudin?

*Trionyx stellatus*, Geoffroy.

*Trionyx stellatus*, apud Merrem.

*Aspidonectes javanicus*, Wagler.

*Adult.*

*Trionyx javanicus*, Geoffroy.

*Trionyx javanicus*, apud Schweigger and Gray.

*Gymnopus javanicus*, Duméril and Bibron.

*Tyrse javanica*, Gray: Catal.

*Very Young.*—Above olive green; the head and upper part of the neck with numerous small white spots, becoming larger and more

distant on the cheeks and chin ; on the vertex, two round black spots ; on the occiput two diverging black lines ; the shell with several large black white-ringed spots, between which numerous smaller indistinct white spots ; margin pale white ; several longitudinal ridges, composed of close minute tubercles. Beneath greenish white.

*Older*.—Above uniformly olive-green ; the longitudinal ridges of the shell consisting of tubercles, more distant and proportionally smaller than in the very young.

HABIT.—*Malayan Peninsula, Pinang.*

Java, Dukhun, "India," "China."

This species is numerous in rivers and ponds. The largest individual observed was of the following dimensions :

Length of the head, . . . . .	2 $\frac{1}{8}$ inch.
Ditto ditto neck, . . . . .	2 $\frac{2}{8}$
Ditto ditto shell, . . . . .	6 $\frac{3}{8}$
Ditto ditto tail, . . . . .	0 $\frac{6}{8}$

#### GYMNOPUS INDICUS, (Gray.)

SYN.—*Testudo chitra*, Buchan. Ham. MSS.

*Trionyx, indicus*, Gray.

*Trionyx aegyptiacus*, Var. *indica*, Gray : Ill. Ind. Zool.

*Gymnopus lineatus*, Duméril and Bibron.

*Chitra indica*, Gray : Catal.

Shell remarkably depressed, smooth.\* Above greenish olive, vermiculated and spotted with brown or rust colour ; beneath greenish white.

HABIT.—*Pinang, Malayan Peninsula, (Estuaries, Sea Coast).*

Rivers in India, Philippine Islands.

At Pinang this species is frequently taken in the fishing stakes. The Chinese inhabitants greatly relish this as well as the preceding species of *Gymnopus*, as articles of food. Individuals weighing 240lbs. occur in the Ganges, and others of gigantic dimensions are not uncommon at Pinang. It is very powerful, and of ferocious habits. The largest individual measured :

\* In the living adult no longitudinal central depression is apparent, nor the outline of the costae, as represented in the figure in *Illustrations of Indian Zoology*.

Length of the head, . . . . .	0	feet	6	inch.
Ditto ditto neck, . . . . .	0		5	
Ditto ditto shell, . . . . .	3		1	
Ditto ditto tail, . . . . .	0		4	

FAM. THALASSIDÆ, OR TURTLES, *Dum. and Bibr.*

GEN. CHELONIA, *Brogniart.*

Body covered with horny plates ; fins with one or two nails.

*Sub-Gen. Chelonia liberæ (Chelonées franches). Dum. and Bibr.*

Discal shields 13, not imbricate ; muzzle short, rounded ; upper jaw slightly notched in front, toothed on the sides ; lower jaw formed of three pieces, and with the edges deeply toothed ; the first finger of each fin nailed.

CHELONIA VIRGATA, *Schweigger.*

SYN.—Turtle of the Red Sea, *Bruce.*

*Chelonia virgata*, apud *Cuvier, Guérin, Duméril and Bibron, Gray : Catal.*

*Chelonia midas*, Var. *D. Gray.*

*Chelonia fasciata*, *Cuvier*, apud *Schlegel.*

“Pinyú” of the Malays of Pinang.

*Young.*—Head, shell and fins greenish black ; margin of the shell and fins and sternum white.

*Adult.*—Head and fins chestnut, scales edged with yellow ; shell greenish yellow with chestnut rays and spots ; sternum gamboge, or greenish yellow.

HABIT.—*Malayan Seas.*

Teneriffe, Rio Janeiro, Cape of Good Hope, New York, Indian Ocean, Red Sea.

This species is at all seasons plentifully taken in fishing stakes in the straits of Malacca, and is the “Green Turtle” of the European inhabitants of our Malayan settlements, and of the sea-ports of India. In size it equals *Chelonia midas*, *Schweigger*, which it rivals in flavour. About December and January is the season when the female deposits her eggs in the sandy beach of some sequestered island, and then the fishermen watch during the moonlight nights to “turn turtles.” The eggs are of a spherical shape, about one inch in diameter, covered by a soft hemitransparent membrane of a pale yellow colour. The expert eye of the fishermen baffles the pains with which the turtle conceals her eggs, and prodigious numbers are disinterred.

They are very rich, flavoured like marrow, and will keep for weeks although exposed to the air.

M. M. Duméril and Bibron have pointed out the differences between the adult of the present species and *Chelonia midas*, Schweigger, principally consisting in colours, and in the form of the vertebral and costal shields, to which may be added the comparative greater length of the fronto-nasal shields in *Chelonia virgata*, in which the breadth is one-third of the length, whereas in *Chelonia midas* it is one-half, and these proportions appear to be constant in all ages of the two species. The very young of both greatly resemble each other in colours and shape. Six living young of the present species were all of the following dimensions :

Length of the head, .....	0 $\frac{7}{8}$ inch.
Ditto ditto neck, .....	0 $\frac{4}{8}$
Ditto ditto shell, .....	2
Ditto ditto tail, ..	0 $\frac{2}{8}$

The following slight differences are the result of a comparison between the living young of *Chelonia virgata* and the representation of *Chelonia midas* given by Schoepff. Tab. XVII. Fig. 2.

*Chelonia virgata.*

*Chelonia midas.*

1. Shell cordiform; the length exceeds the breadth by one-eighth.

1. Shell ovate; the length exceeds the breadth by more than two-eighths.

2. 2d vertebral shield much broader than 1st, and is altogether the largest of the series.

2. 1st and 2nd vertebral of equal dimensions.

3. 2d costal shield larger than the 3d.

3. 2d and 3d costal equal.

4. Sincipital plate broader than long.

4. Sincipital plate longer than broad.

5. Breadth of fronto-nasal shields one third of their length.

5. Breadth of fronto-nasals one half of their length.

6. Each fin with a single nail.

6. Each fin with 2 nails.

*Sub. Gen. Chelonice imbricatae, (Chélonées imbriquées,) Dum. and Bibr.*

Discal shields 13, imbricate; muzzle long, compressed; jaws with the edge straight, not toothed, at the extremity slightly recurved: each fin with 2 nails.

## CHELONIA IMBRICATA. (Linné.)

SYN.—La Tortue Caret, Dntertre.

Scaled Tortoise, Grew.

Caret, Labat, Fermin, Lacép., Bose, Cuvier.

Testudo marina americana, Seba.

Hawksbill Turtle, Brown, Catesby.

Testudo imbricata, Linné, apud {  
 Gmelin.  
 Pennant.  
 Dond.  
 Schoepff.  
 Latreille.  
 Schneider.  
 Shaw.  
 Daudin.

Testudo caretta, Knorr.

La Tuilée, Daubenton.

Caretta imbricata, Merrem, apud Gray : Catal.

Chelonia multiscutala, Kuhl?

Chelonia imbricata, Schweig- {  
 ger, apud. .... Prince Maxim.  
 Gray.  
 Duméril and Bibron.  
 Prince Musignano.  
 Bell.

Chélonée faux caret, Lesson.

Chelonia caretta, Temminck, and Schlegel.

"Kúra-kúra" of the Malays of Pinang.

Head brown, scales edged or rayed with yellow ; shell yellow, marbled or rayed with rich brown ; sternum yellowish white. In the young the areola of the sternal shields black.

HABIT.—*Malayan Seas.*

Atlantic and Indian Ocean.

The largest individual observed was of the following dimensions :

Length of the head, .....	0 feet 4 $\frac{1}{8}$ inch.
Ditto ditto neck, .....	0 3 $\frac{1}{8}$
Ditto ditto shell, .....	1 7
Ditto ditto tail, .....	0 2 $\frac{2}{8}$

*Sub. Gen. Caouanae, (Caouanes,) Dum. and Bibr.*

Discal shields 15, not imbricate ; jaws at the extremity slightly recurved.

## CHELONIA OLIVACEA, Eschscholtz : Atlas.

SYN.—Chelonia caouana, Var. B. Gray.

Chelonia dussumierii, Dum. and Bibr.

Caouana olivacea, Gray : Catal.

*Young*.—Above blackish olive, lighter than in the adult ; shell and fins edged with pale yellow ; sternum pale greenish yellow, washed with chestnut, areolæ blackish.

*Adult*.—Head brown ; shell blackish green ; some of the marginal scales of the fins yellow ; sternum yellow, washed with chestnut ; 27 marginal shields ; fins with one nail.

HABIT.—*Malayan Seas*.

Bay of Bengal, Chinese Seas.

This species is at Pinang of rare occurrence. A single young individual observed was of the following dimensions :

Length of the head, . . . . .	$1\frac{7}{8}$ inch.
Ditto ditto neck, . . . . .	1
Ditto ditto shell, . . . . .	6
Ditto ditto tail, . . . . .	$0\frac{7}{8}$

The shell is broad sub-cordiform, (its length exceeding its breadth by half an inch,) three-keeled, the vertebral keel strongest, dentated behind ; the marginal shields 27, obliquely placed. The 1st and 4th pair of costals, and the 4th vertebral shield each divided in two pieces.

In a not quite full-grown specimen, in the Museum of the Asiatic Society, the length of the shell is 2ft.  $1\frac{4}{8}$  inch ; its greatest breadth is 2ft.  $0\frac{4}{8}$  inch, the length exceeding the breadth by one inch. The vertebral shields are still slightly keeled. The 1st and 4th pair of costals, the 2nd left costal, and the 4th vertebral are divided. The central part of the margin is slightly curved upwards. The edges of the jaws are not toothed, but they are transparent with fine white vertical lines, which give them a fringed appearance.

The flesh of this turtle, though relished by the Chinese settlers, is unpalatable to Europeans.



## SAURIA.

FAM. CROCODILIDÆ, Bonaparte (ASPIDIOTES, Dum. and Bibr.)

Sub. Gen *Crocodilus*, apud Curirr.

Muzzle oblong, depressed; teeth unequal, the 4th of the lower jaw fitting into lateral notches, and not into hollows of the upper jaw. Skull behind the eyes with two large holes, perceptible through the integuments. Hind-feet with an external dentated crest, and the toes palmated.

CROCODILUS VULGARIS, Cuvier.—VAR. B., Dum. and Bibr.

SYN.—*Crocodilus palustris*, Lesson.*Crocodilus vulgaris*, Var. E. Gray.*Crocodilus biporcatus* raminus, Müller, Tab. 3, Fig. 7.*Crocodilus palustris*, apud Gray: Catal.

"Buaya" of the Malays.

Muzzle a little widened, thick, transversally very slightly curved; head covered with angular rugosities; lateral margins of the skull not raised. Above greenish-olive, speckled with black; beneath yellowish or greenish-white.

HABIT.—*Malayan Peninsula and Islands.*

Java, Sumatra, Tenasserim, Bengal, Coromandel, Malabar.

It inhabits not only rivers and estuaries, but also the sea-coasts, and may in calm weather be seen floating at a distance of two to three miles from the shore. Although numerous at Pinang and the opposite coast, it appears to be less so than *Crocodilus biporcatus*. Fishermen while working the nets are not seldom attacked by Crocodiles, and would, but for their presence of mind, oftener than they do, forfeit their lives. When seized, they force the fingers into the eyes of the Crocodile, which immediately lets go its victim, who is farther rescued by his comrades.—From 1842 to 1845 amputations from accidents of this description, were unfortunately of no rare occurrence in the General Hospital at Pinang.

Individuals, 15 feet in length are not uncommon; some attaining to 20 feet and upwards are reported to occur.—In rivers a single one will often appropriate to himself a limited district, which if it happens to be in the vicinity of a village, will soon be perceived in the loss of the grazing cattle. Instances of Malays, who, to avenge the loss of a relative, have watched the crocodile, and by diving from below, plunged a Kris into its

heart, are on record. The eggs are white, the shell hard, of a cylindrical form, upwards of 3 inches in length, and about  $1\frac{1}{2}$  inch in diameter.

**CROCODILUS POROSUS**, Schneider.

SYN.—*Crocodili Ceyloniei* ex ovo prodiens, Seba.

Cr. biporeatus, Cuvier, apud	{	Tideman, Oppel, Liboschitz.
		Merren.
		Bory de St. Vincent.
		Fitzinger.
		Lesson.
		Guerin.
		Wagler.
		Gray.

*Crocodilus biporeatus raninus*, Müller, Tab. 3, Fig. 8.

*Crocodilus porosus*, Sehn., apud Gray : Catal.

"Buáya" of the Malays.

Upper jaw surmounted by two rugged ridges, each commencing from the anterior angle of the eye; nuchal plates either none, or two very small. Above yellowish green with large black oval spots; keels of the dorsal scales green; beneath greenish white.

HABIT.—*Malayan Peninsula, Pinang, Singapore.*

India, Tenasserim, Sumatra, Java, Timor, Seychelle Islands.

This, in the Malayan countries exceedingly numerous species, is of the same habits, and attains to the same size as the preceding.

**FAM. GECKONIDÆ**, Bonaparte (ASCALABOTES, Dum. and Bibr.)

**GEN. PLATYDACTYLUS**, Cuvier.

Toes more or less dilated throughout their length, beneath with transverse imbricate plates, either entire or divided by a central longitudinal groove.

**PLATYDACTYLUS LUGUBRIS**, Dum. and Bibr.

SYN.—*Anydosaurus lugubris*, Gray.

Thumbs nailless; transverse plates beneath all the toes; back finely granular. Above whitish, with black spots.

HABIT.—*Pinang.*

Otaheite.

A single male was captured in my house in the valley of Pinang. The integuments correspond to the description given by M. M. Duméril and Bibron, to which may be added the following characters:



The skin is somewhat loose, forming a slight longitudinal fold on each side of the body, and on the anterior margin of the thigh. The anus is covered by a transversal fold, reaching across from the one thigh to the other. There are no femoral pores. The tail is tapering, much depressed, convex on the upper surface, flat beneath, sharp at the sides. Near the root, about  $\frac{2}{8}$  of an inch distant from the anus, the skin forms an annular fold, completely encircling that part of the tail. The colour slightly differs from that of the Otaheite individuals. The upper parts and the lower surface of the tail from the annular fold are of a buff or pale dust colour, so closely and minutely dotted with reddish brown, that the parts have a pale greyish brown appearance. On the loins and between the shoulders are a few distant blackish spots, besides in the latter place appear two short lateral lines, and an indistinct band proceeds from the nostril across the eye to the shoulder. The throat, inner side of the limbs, abdomen and the lower surface of the root of the tail to the annular fold are buff-coloured. The pupil is black, vertical, dentilated, the iris silvery, dotted with reddish brown.

Length of the head . . . . .  $0\frac{4}{8}$  inch.

Ditto ditto trunk . . . . .  $1\frac{2}{8}$

Ditto ditto tail . . . . .  $1\frac{3}{8}$

Entire length . . . . .  $3\frac{1}{8}$  inch.

#### PLATYDACTYLUS GECKO, (Linné.)

SYN.—*Salamandra indica*, Bontius.

*Gekko ceilonicus*, Seba.

*Lacerta cauda tereti medioeri*, Linné mus. Adolph.

*Lacerta gecko*, Linné.

*Gekko teres*,

*Gekko verticillatus*, } Laurenti.

*Salamandre, ou Gecko de Linneus*, Knorr.

*Stellio gecko*, Schneider

*Common Gecko*, Shaw.

*Gecko guttatus*, Daudin, apud Gray.

*Lacerta guttata*, Hermann.

*Gecko verus*, Merrem, apud { Gray. Zool. Journ.  
Gray. Catal.

*Gecko annulatus*, Kuhl

*Gecko à gouttelettes*, Cuvier

*Platydictylus guttatus*, Cuv. apud Guerin, Dum. and Bibr.

"Toké" of the Malays.\*

\* The Malays denominate the family of *Geckotidae*: *Gékko*, *Kéko*, *Gágo*, *Goké*, evidently *Onomatopoeias*, in imitation of the cry of these lizards.

Above ash-coloured with numerous pale orange spots; beneath yellowish white. Between the scales of the back 12 longitudinal rows of large distant tubercles, and six similar on the tail; the latter with minute scales beneath.

HABIT.—*Malayan Peninsula.*

Philippine Islands,

Java, Tenasserim, Burmah, Bengal, Coromandel Coast.

On the Malayan peninsula this species appears to be less numerous than in the Tenasserim Provinces, where its shrill cry, "To-ke" is nightly heard in houses. The male has two tubercular scales on each side of the root of the tail. The largest individual observed was of the following dimensions:

Length of the head, .....	$1\frac{7}{8}$ inch.
Ditto ditto trunk, .....	$4\frac{2}{8}$
Ditto ditto tail, .....	$4\frac{5}{8}$
Entire length .....	$10\frac{6}{8}$ inch.

#### PLATYDACTYLUS STENTOR. N. S.

SYN.—"Toké" of the Malays.

Above light bluish grey with numerous irregular blackish spots, forming on the vertex an angle like an inverted V., and on the neck short oblique lateral bands. Beneath pearl-coloured. On the back and sides 10 longitudinal rows of large distant lenticular scales, and 6 similar on the tail; the latter with scutella beneath.

HABIT.—*Pinang.*

In form and size this species closely resembles the preceding, from which it however differs in the following particulars. The oval nostrils are bordered in front by three scales, viz. the first upper-labial, a smaller rectangular, and a larger pentagonal scale, both of which latter are situated between the nostril and the rostral. Above the nostrils are surrounded by two smaller irregular triangular, and behind by a narrow crescent-shaped scale. Of labial scales there are 14 above, 12 below. There are about 72 teeth in each jaw. The eye is very large; pupil black dentilated; iris silvery bluish grey. The ear is very large, ob-

liquely oval without dentilations. The cheeks are much swollen. The scales of the back are small, rounded, hexagonal, becoming more rectangular on the sides. The rows of lenticular scales along the vertebræ are smaller than the rest, but not so close as in *P. guttatus*. Behind the mental scale is a pair of large elongated scales, and 5 pentagonal larger appear on each side behind the lower labials. The gular scales are small, polygonal; the abdominal are rounded, hexagonal, not imbricate, and below the root of the tail become somewhat larger. The rest of the lower surface of the tail is covered with scutella. Above the covering of the tail is like that of *P. guttatus*. On each side of the posterior margin of the cloaca are two very large tubercular scales, and towards the centre two rather large postanal pores, covered by a loose fold of the skin. Fourteen femoral pores are placed on a slightly angular line. This species is also closely allied to *Platydictylus monarchus*, Schlegel, from which it however readily may be distinguished by the regular rows of lenticular dorsal scales, by its far greater size, and by its loud note. It is not numerous at Pinang. The only individual obtained, from the villa on the Pentland Hills, was a male of the following dimensions :

Length of the head, . . . . .	2 $\frac{2}{8}$ inch.
Ditto ditto trunk, . . . . .	5 $\frac{4}{8}$
Ditto ditto tail, . . . . .	8 $\frac{2}{8}$
Entire length . . . . .	1 ft. 4 inch.

#### PLATYDICTYLUS MONARCHUS, Schlegel, MS.

SYN.—*Platydictylus monarchus*, Schl. apud Dum. and Bibr.  
*Gecko monarchus*, Gray: Catal.

On the back, sides and limbs numerous conical tubercles irregularly scattered among the smaller flat polygonal scales; on the upper surface of the tail 6 to 13 transversal series of small spines; beneath scutella, sometimes mixed with scuta. Chin with 2 larger oblong scales.

*New-born*.—Above brown, with the dorsal and caudal tubercles (no spines) white; the posterior part of the tail indistinctly white ringed; beneath uniformly paler brown.

*Adult*.—Above buff or ash-coloured or reddish brown, with 8 to 12 pairs of irregularly rounded, distant, dark brown spots along the spine;

the head, limbs and sides with numerous more or less distinct, irregular dark brown spots; in some younger individuals the tail with whitish rings. Beneath yellowish white.

HABIT.—*Malayan Peninsula, Pinang, Singapore.*

*Philippine Islands, Amboyna, Borneo.*

The *Malayan Geckonidae* have the power of somewhat changing the ground colour, none however in a greater degree than the present species. In the valley and on the hills of Pinang it is very numerous, swarming at night in rooms, on the walls, and under the ceiling, occasionally giving out a sound, resembling the monosyllable "Tok," repeated 6 or 8 times with increased celerity. The aim of these lizards is by no means unerring; they frequently miss an insect, and fall from the ceiling. Among themselves they are pugnacious: when two or more covet an insect, the successful one has to defend its prize, or give it up to the stronger. The new-born (with umbilical aperture) and adult are of the following dimensions:

	<i>New-born.</i>	<i>Adult.</i>
Length of the head, . . . . .	0 $\frac{3}{8}$	1 $\frac{2}{8}$ inch.
„ „ trunk, . . . . .	0 $\frac{5}{8}$	2 $\frac{2}{8}$
„ „ tail, . . . . .	1 $\frac{1}{8}$	3 $\frac{1}{8}$
Entire length, . . . . .	2 $\frac{1}{8}$	6 $\frac{5}{8}$ inch.

*Sub-Gen. Ptychozoon, Kuhl.*

Toes webbed to the last compressed joint; thumbs nailless; sides of the head, body, limbs and tail with broad scaly membranes, those of the tail anteriorly scalloped. Male with femoral pores. On the sides scattered tubercles.

#### PTYCHOOZON HOMALOCEPHALUM, (Creveld.)

SYN.—*Lacerta homalocephala*, Creveld.

*Gecko homalocephalus*, Tilesius.

*Ptychozoon homalocephalum*, apud { *Fitzinger.*  
*Wagler.*  
*Wiegmann.*

*Pteropleura horsfieldii*, Gray.

*Platydaetylus homalocephalus*, Cuv. apud Dum. and Bibr.

*Ptychozoon homalocephala*, Kuhl. apud Gray: Catal.

*Head.* The ground colour yellowish green olive. Between the eyes and muzzle a double figure, in whitish outline, representing in front a

broad arrowhead, posteriorly united by a narrow stalk to a rectangular transversal band, situated in front of the eyes. On the vertex another, larger figure, traced in whitish outline, rectangular in front, spreading like a four-rayed star over the occiput. A dark brown band proceeds from behind the eye, across the ear, to the shoulders, where it is lost in the general dark brown colour of the sides of the body. The superior margins of these two lateral bands are white proceeding backwards in zig-zag line, approaching each other over the shoulders, where they join the anterior black transversal line. The lips white. The membranes of the cheeks pale flesh-colour, with dark blue spots, and with the interstices between the scales pale lilac. The pupil vertical, denticulated; the iris rich golden brown.

*Back.* Of the same ground colour as the head, becoming dark reddish brown on the sides, relieved by 4 to 6 distant transversal black dotted lines, on the upper part of the form of the letter M, sending oblique, forwards pointed, lines on the sides. The upper part of the lateral membrane reddish brown; the interstices of the small rectangular scales purple.

*Tail and limbs.* Same ground-colour, as that of the head and back, with broad, distant, indistinctly whitish, transversal bands. On each elbow a whitish ring. Membranes of the tail, limbs and toes are yellowish grey with numerous minute spots of brown, purple, blue and red, which impart a purple, changing appearance to the general colour. The number of the indentations of the caudal membranes varies individually; the posterior part is entire, with waving surfaces.

*Lower parts.* Brownish white, with a few pale brown spots on the throat, innerside of the limbs, in the palms and soles. The tail and its membranes brownish.

*HABIT.*—*Pinang Hills.*

Singapore, Java, Ramree Island, (Arracan.)

As correctly observed by M. M. Duméril and Bibron, the scales of the female, corresponding to those with the femoral pores of the male, have a slight, yet distinct, central depression. The female has a large tubercular scale on each side of the root of the tail, as well as the male. In colour and size the two sexes resemble each other. Two individuals were at different times captured in the villa occupied by Sir William Norris on the Great Hill of Pinang. When the lizard

is at rest, the membranes of the cheeks, and the body are kept in close contact with these parts; in leaping those of the body are somewhat stretched out, and all the membranes together then act as a parachute. Also this lizard has in some degree the power of changing the ground colour from a darker to a lighter shade. The apex of the tongue is rounded, with a small notch in the centre. A female while in my possession refused insects and water. She deposited a single egg, of a spherical form, about half an inch in diameter, soft, and of a yellowish white colour, which the following day she devoured. A male ate the integuments he had been changing. The female was of the following dimensions :

Length of the head, . . . . . 1 inch.

Ditto ditto trunk, . . . . .  $2\frac{6}{8}$

Ditto ditto tail, . . . . .  $3\frac{5}{8}$

Entire length,  $7\frac{3}{8}$  inches.

In the Museum of the Asiatic Society is preserved a specimen of *Leptophis ornatus*, (Merrem,) in the act of devouring one of the present species. The serpent was captured in the island of Ramree on the coast of Arracan.

#### GEN. HEMIDACTYLUS, Cuvier.

End of the toes widened into an oval disk, with a double series of transverse, imbricate plates beneath. From the middle of the disk rise the slender second and third nailed phalanx. A series of scuta beneath the tail.

#### HEMIDACTYLUS PERONII, Dum. and Bibr.

SYN.—*Hemidactylus leiurus*, Gray.

*Peripia peronii*, Gray : Catal.

Under the chin a large triangular figure, composed of six elongated, towards the sides decreasing, scales; thumbs nailless; male with femoral pores; tail much depressed, very broad at the root, tapering towards the point, (sometimes with a small membrane on each side of the point,) with a series of scuta beneath; pupil vertical, shaped like two rhombs placed with the angles towards each other.\*

\* Such is its appearance in the living animal, when the eye is exposed to the influence of light. M. M. Duméril and Bibron note the pupil being "elliptical," which probably originates in their describing from preserved specimens, although my own in spirits of wine have retained the original form of the pupil.



Above ash-coloured, labial scales whitish, each with a brown spot ; beneath whitish. Iris silvery grey, spotted with brown.

HABIT.—*Pinang*.

Isle of France.

Of two individuals, captured at different times in my house in the valley of Pinang, the larger was of the following dimensions :

Length of the head, . . . . .  $0\frac{6}{8}$  inch.

Ditto ditto trunk, . . . . .  $1\frac{5}{8}$

Ditto ditto tail, . . . . .  $2\frac{3}{8}$

---

Entire length,  $4\frac{6}{8}$  inches.

#### HEMIDACTYLUS COCTEI, Dum. and Bibr.

Thumbs well developed, nailed ; \* back with minute granular scales ; in some individuals with a few larger ones on the sides ; tail broad at the root, tapering, a little depressed, with from 4 to 15 indistinct rings and 6 series of minute spines ; beneath with scuta ; chin with 4 larger scales ; the central pair elongate pentagonal ; male with 12 femoral pores ; pupil as in *Hemidactylus peronii*.

Above ash-coloured, whitish beneath.

HABIT.—*Pinang*.

Bengal, Bombay.

Of two males observed in houses in the valley of Pinang, the larger was of the following dimensions :

Length of the head, . . . . .  $1\frac{2}{8}$  inch.

Ditto ditto trunk, . . . . .  $2\frac{4}{8}$

Ditto ditto tail, . . . . .  $3\frac{2}{8}$

---

Entire length, 7 inches.

#### HEMIDACTYLUS FRENATUS, Schlegel, MS.

SYN.—*Hemidactylus frenatus*, Schlegel, apud Dum. and Bibr.

*Hemidactylus lateralis*,  
*Hemidactylus quinquelineatus*, } Gray : B. M.

Back with some larger granular scales ; tail rounded, tapering above, with 6 series of small spines, scuta beneath ; chin with 4 or 6 larger

\* Mr. Gray gives the present species as a Syn. of *Boltalia sublavis*, Gray, (Catalogue, p. 158.) As the latter species is characterised as having the thumbs "clawless," it cannot be identical with *H. coctei*.

scales ; ears very small ; pupil as in the preceding species ; thumbs very small, femoral pores 26 to 28, disposed on a slightly angular line.

*Young and Adult*.—Buff or ash-coloured, with or without brown spots ; some with one or two brown lateral bands, commencing one above the other from the muzzle, interrupted or continued to the tail ; the latter in some with indistinct brown rings. Beneath whitish or buff.

**HABIT**.—*Malayan Peninsula, Pinang, Singapore.*

Amboyna, Timor, Java, Marianne Islands, Ceylon, Bengal Assam,\* South Africa, Madagascar.

In the Malayan valleys and hills this small species is very numerous. It is of fierce habits, like several other *Geckonidae*, destroying its own species. Its normal colour appears to be greyish, which it however has in its power to change. The largest individuals observed were of the following dimensions :

Length of the head, . . . . .	0 $\frac{5}{8}$ inch.
Ditto ditto trunk, . . . . .	2
Ditto ditto tail, . . . . .	2
<hr/>	
Entire length, . . . . .	4 $\frac{5}{8}$ inches.

### HEMIDACTYLUS PLATYURUS, (Schneider.)

**SYN**.—*Stellio platyurus*, Schneider.

*Iacerta schneideriana*, Shaw.

*Gecko platyrus*, Merrem.

*Hemidactylus platyrus*, Wiegmann.

*Hemidactylus marginatus*, Cuvier, apud  $\left\{ \begin{array}{l} \text{Wagler.} \\ \text{Wiegmann.} \\ \text{Gray.} \end{array} \right.$

*Platyrus schneiderianus*, Gray : Catal.

Sides of the body and posterior margin of the thighs with a loose membrane ; tail tapering, depressed, with sharp, fringed margins, with scuta beneath ; toes webbed half their length ; chin with 4 pentagonal broad scales, placed in pairs, behind each other : 6 femoral pores placed on a continued line.

*Young and Adult*.—Above ash-coloured, in some with a greyish brown lateral band, from the muzzle continued to the tail ; the latter with indistinct brownish transversal bands ; others irregularly spotted and

\* Specimens in the Museum of the Asiatic Society.



marbled with blackish brown; pupil and iris as in the preceding species. Whitish beneath.

HABIT.—*Pinang*.

Philippine Islands, Borneo, Java, Bengal, Assam.\*

The individuals were observed in houses in the valley of Pinang. In a male the posterior half of the tail happens to be divided so as to appear double; one of the pieces, the continuation of the normal tail, is depressed, slightly fringed, and beneath with the row of scuta continued, the other is cylindrical, somewhat shorter, and above and below covered with minute scales. The largest individual was of the following dimensions:

Length of the head, . . . . .	$0\frac{5}{8}$ inch.
Ditto ditto trunk, . . . . .	2
Ditto ditto tail, . . . . .	$2\frac{1}{8}$
<hr/>	
Entire length, . . . . .	$4\frac{6}{8}$ inches.

#### GEN. GYMNOTACTYLUS, *Spir.*

Toes not widened into a disk, nor with dentilated margins; all five with non-retractile nails; fifth hind-toe versatile or capable of turning from the others under a right angle.

#### GYMNOTACTYLUS PULCHELLUS, (Gray.)

SYN.—*Cyrtodactylus pulchellus*, Gray.

*Gonyodactylus pulchellus*, Wagler.

*Gymnodactylus pulchellus*, Duméril and Bibron.

Head, back and limbs with numerous three-sided tubercles among the smaller flat scales; sides of the body with a longitudinal fold of the skin; the anterior upper part of the cylindrical tail with distant rings of rounded, pointed tubercles; beneath a row of scuta. Chin with six scales, the centre pair elongated pentagonal. Males with 36 femoral pores on two not connected lines, between which, in front of the anus, a short narrow, longitudinal furrow. Both sexes with 3 or 4 tubercles obliquely situated on each side of the root of the tail.

*Young and Adult*.—Above a rich brownish ochre; the nape of the neck and back with 6 broad transversal bands (the two anterior horse-shoe shaped), of a rich velvety mulberry, or snuff-colour with sulphur

\* Specimens in the Museum of the Asiatic Society.

or chrome-yellow margins. The tail with 8 or 9 complete rings of similar colour, without the margins. Beneath : throat and belly whitish yellow, or pale brownish, each scale minutely dotted with brown. Pupil vertical, dentilated ; iris golden, finely vermiculated with Van Dyke brown.

HABIT.—*Pinang Hills.*

Singapore.

In the male the two rows of femoral pores commence as two short parallel longitudinal lines, separated from each other by a narrow short furrow, on the sides of which, (vertically,) the first 5 femoral (preanal), pores are placed. In front of the anus the short vertical portions turn right and left under a nearly right angle, continuing the entire length of the thigh, each supporting 13 more femoral pores. The interval between the anus and the latter is partly occupied by a flat, slightly raised triangular space, covered by rather large, imbricate, rounded scales. In the female the two lines of larger scales carrying the femoral pores of the males, are present, each scale having a small shallow, round depression. The short, longitudinal furrow of the male is either wanting or barely distinguishable, but the triangular space with larger scales, in front of the anus, is present. The species appears to be rather numerous on the hills at Pinang, where the individuals obtained were captured in houses, at an elevation of 2,200 feet. The largest male was of the following dimensions :

Length of the head, . . . . .  $1\frac{4}{8}$  inch.

Ditto ditto trunk, . . . . . 3

Ditto ditto tail, . . . . .  $5\frac{4}{8}$

---

Entire length, 10 inches.

Its habits offer nothing peculiar : it bites fiercely in defence. In captivity it refuses insects. The integuments, when about being renewed, are piecemeal torn off by the teeth, and devoured. A single egg deposited was of a spherical form, about half an inch in diameter, of a whitish yellow colour. M. M. Duméril and Bibron assign Bengal as the Habitat of this species. The specimen originally described by Mr. Gray, some in the Museum of the Asiatic Society, and a number in my own collection, all are from the hills of Prince of Wales Island (Pulo

Pinaug,) but no authenticated record exists of this species ever having been observed in Bengal. Another, widely different species of *Gymnodactylus* inhabits Bengal, as yet not published, and only known from three specimens, preserved in spirits in the Museum of the Asiatic Society, where they are marked *Gymnodactylus lunatus*, Blyth. One of these came from Midnapore, the others from Chyebassa. The species somewhat approaches to *G. fasciatus*, Dum. and Bibr. (*Cubina fasciata*, Gray.) The Museum possesses another nondescript species from Almorah, *Gymnodactylus nebulosus*, Blyth, MSS. allied to *G. marmoratus*, (Gray).

The plate of *Cyrtodactylus pulchellus* in Gray's Illustrations of Indian Zoology is not taken from life, and gives a most inadequate idea of the physiognomy and beauty of the living animal. This should be observed, as M. M. Duméril and Bibron praise the figure, which evidently has served as original of their own description, and of copies introduced in illustrative works upon that order of animals.

FAM. VARANIDÆ, Bonaparte, (PLATYNOTES, Dum. and Bibr.)

GEN. VARANUS,—Merrem.

Scales set side by side, surrounded by an annular series of very minute tubercles; tail above more or less trenchant; on the throat a fold in front of the chest.

*Varani aquatici*,—Dum. and Bibr.

VARANUS NEBULOSUS,—Duméril and Bibron.

Syn.—*Tupimambis nebulosus*, Cuvier MSS.

*Monitor nebulosus*, Gray.

*Monitor nebulatus*, Schlegel.

*Varanus nebulosus*, apud Gray: Catal.

Muzzle very elongated; nostrils obliquely cleft, situated half-ways between the muzzle and the anterior angle of the eye; lips each with 50 scales; teeth compressed with sharp but not denticulated edges.

Young.—Above. Ground-colour deep chocolate brown; the head largely marbled with greenish yellow; neck with indistinct obliquely converging gamboge lines; back, sides and limbs with gamboge spots, consisting of one to five scales, (those of the upper margins of the fingers forming continued lines;) sides of the anterior half of the tail, similarly coloured; the double row of scales covering the back of the tail gamboge;

the posterior half deep chocolate with two distant, (the second subterminal,) indistinct gamboge coloured rings.

Beneath. Ground-colour pale chocolate. Chin, throat, chest and forelimbs transversely undulated with greenish yellow; abdomen with short, interrupted, transversal yellow bands, consisting of from 4 to 12 scales; hind-limbs with larger similar spots; anterior half of the tail indistinctly marbled with yellowish green; posterior half like the upper surface. Pupil round; iris narrow golden.

*Adult*.—Above brownish olive with yellow dots; anterior half of the tail yellow with minute square brown spots; posterior half brown and yellow-ringed; margins of the toes yellow. Beneath marbled and barred with brown and yellow.

HABIT.—*Pinang*.

Java, Siam, Bengal.

The only individual observed was a young male, captured in the hills at Pinang, of the following dimensions:

Length of the head, . . . . .	1 $\frac{5}{8}$ inch.
Ditto ditto trunk, . . . . .	5 $\frac{2}{8}$
Ditto ditto tail, . . . . .	9 $\frac{1}{8}$

Entire length, 16 inches.

#### VARANUS FLAVESCENS, (Gray).

SYN.—*Monitor flavescens*, Gray.

*Monitor hardwickii*, Gray, MSS.

*Varanus russellii*, Schlegel, MSS.

*Monitor exanthematicus*, Var *indica*, Schlegel.

*Varanus picquotii*, Dum and Bibr.

*Empagusia flavescens*, Gray: Catal.

Muzzle obtuse; nostrils oval, oblique, nearer the muzzle than the orbit; a series of supraorbital scales larger than the rest; scales of the back distant, bluntly keeled, of the tail and outside of the hind-limbs closer, sharply keeled; toes very short, nails yellow.

Above. Ground-colour light green-olive with numerous distant, interrupted, transversal, yellow bands; temples, cheeks and lips yellow. Beneath yellow; the throat with transversal pale brownish bands.

HABIT.—*Pinang*.

Bengal, Nipal.

A single male observed was of the following dimensions:

Length of the head, . . . . .	0 feet 3 inch
Ditto ditto trunk, . . . . .	1 0 $\frac{5}{8}$
Ditto ditto tail, . . . . .	1 6 $\frac{1}{8}$
<hr/>	
Entire length, . . . . .	2 feet 9 $\frac{6}{8}$ inch.

## VARANUS SALVATOR. (Laurenti).

SYN.—*Lacertus indiens*, Lochner?

*Lacerta mexicana*, Seba.

*Lacertus americanus*, amphibius *Tupinambis dietus*: Seba.

*Stellio salvator*, Laurenti.

Monitor Lizard, Shaw.

*Lacerta monitor*? Hermann.

*Tupinambis bivittatus*, Kuhl, apud Boie.

Monitor elegans, Gray.

Monitor à deux rubans, Cuvier.

*Hydrosaurus bivittatus*, Wagler.

Monitor vittatus, Lesson.

*Varanus bivittatus*, Duméril and Bibron.

*Hydrosaurus salvator*, Gray: Catal.

"Beyáwak" of the Malays of the Peninsula.

Head very elongated; nostrils oval, nearly transversal, close to the muzzle; a series of supraorbital scales, larger than the rest; teeth with denticulated edges; toes very long. Above. Ground colour dark brown or black; a band on the side of the neck from the shoulder to the eye, 5 to 7 distant, transversal series of separate rings, between which numerous spots or interrupted transversal lines, all yellow or yellowish white; the outside of the limbs and the tail spotted, the latter indistinctly banded with yellow. Beneath yellow, the throat with indistinct transversal black bands and minute spots; the sides of the body and limbs in some individuals with large blackish denticulations.

HABIT.—*Malayan Peninsula, Pinang.*

Philippine and Molueca Islands, Amboina, Java, Bengal.

This species is very numerous both in hilly and marshy localities. It is commonly during the day observed in the branches of trees overhanging rivers, preying upon birds and their eggs, and smaller lizards, and when disturbed, it throws itself from a considerable height into the water. When attacked on level ground, it attempts its escape by running, if possible towards the water. Its quickness however is not so great as to prevent a man from overtaking it, when it will courageously defend itself with teeth and claws and by strokes of the tail. The

lowest casts of Hindoos capture these lizards commonly by digging them out of their burrows on the banks of rivers, for the sake of their flesh, which by these people is greatly relished.—Some individuals attain to nearly 7 feet in length, but the majority are smaller. A female examined was of the following dimensions :

Length of the head, . . . . .	0 feet $4\frac{1}{8}$ inch.
Ditto ditto trunk, . . . . .	1 $3\frac{1}{8}$
Ditto ditto tail, . . . . .	2 $8\frac{1}{8}$

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Entire length, 4 feet  $4\frac{1}{8}$  inch.

FAM. IGUANIDÆ, Gray, (EUNOTES, *Duméril and Bibron.*)

SUB-FAM. ACRODONTINÆ (ACRODONTES, Dum. and Bibr.)

GEN. CALOTES, *Cuvier.*

Head quadrangular pyramidal, more or less elongated, with small angular scales of nearly equal diameter. Occipital scale minute. Tongue thick, fungous, rounded, with the apex slightly notched. In the upper-jaw 5 incisors and 2 canines. Nostrils lateral, pierced through a plate situated close to the muzzle. No transversal fold on the throat, sometimes with a large longitudinal fold on both sides. A gular pouch varying in size. A crest from the nape of the neck to the tail. Scales of the sides of the trunk homogeneous, imbricated in oblique series. No femoral pores.

SUB.-GEN. BRONCHOCELA, *Kaup.*

Scales of the trunk in oblique series, inclined backwards, their points directed downwards. Posterior part of the sides of the head not swollen.

BRONCHOCELA CRISTATELLA, (Kuhl.)

SYN.—*Lacerta mexicana strimosa*, &c. Seba, 89, 1.

*Agama cristatella*, Kuhl.

*Agama gutturosa*, Merrem.

*Bronchocele cristatella*, Kaup, apud Dum. and Bibr.

*Agama moluccana*, Lesson, apud Schiuz.

*Calotes gutturosa*, Guérin.

*Calotes cristatellus*, Schinz.

*Calotes gutturosus*, Wiegmann.

"Grüning" of the Malays of the Peninsula.

Cervical crest (6 to 10 scales,) abruptly decreasing on the anterior part of the back; scales of the side of the trunk keeled, scarcely half the size of those of abdomen; behind the posterior angle of the orbit



3 to 5 flattened scales, pointing outwards, forming a minute longitudinal crest.

*Normal colours.* Beautiful grass green, lighter beneath, entirely, or partially changeable to light grey, greyish olive, greenish brown, or blackish, sometimes with orange spots, or with indistinct black network; large isolated round spots on the head or back, or the lips, eyelids, or margins round tympanum, momentarily black; sometimes with transversal distant brown bands, particularly on the tail.\* Scales of the outside of the limbs and feet edged with brown. Pupil circular; iris brown with a narrow golden ring.

HABIT.—*Malayan Peninsula, Pinang, Singapore.*

Amboyna, Island of Buru, Java, Sumatra.

This species is very numerous in the Malayan countries both in the vallies and on the hills. It moves and leaps with great quickness among the branches of trees. The most striking feature is the great power of suddenly changing its colours. The Malayan denomination of this species is "*Gruning*," which in Marsden's Dictionary is translated "a species of lizard, which changes its colour as it is affected by fear or anger; the camelcon." No camelcon however appears to inhabit the Malayan countries, but the present lizard passes under that name among the European inhabitants. One of the largest males was of the following dimensions:

Length of the head, . . . . .	0 feet $1\frac{3}{8}$ inch.
Ditto ditto trunk, . . . . .	0 $3\frac{6}{8}$
Ditto ditto tail, . . . . .	1 $2\frac{6}{8}$

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Entire length, 1ft.  $7\frac{7}{8}$  inch.

Those of the intestinal canal:

Small intestines, . . . . .	$3\frac{4}{8}$ inch.
Large, ,, . . . . .	$1\frac{4}{8}$
Cæcum, ,, . . . . .	$0\frac{4}{8}$

The stomach is cylindrical, simply a continuation of oesophagus without fundus, but separated from the small intestines by a valve. In

\* During life there is no trace of blue, or even bluish green about this lizard, but after death it sometimes acquires this colour from the effects of spirits of wine, to which circumstance must be attributed the denomination of "Blue Calotes," Gray, in Griffith's edition of Cuvier. Vol. 9, p. 55.

several dissected it contained nothing but mucus. The length of oesophagus and the stomach together was  $1\frac{6}{8}$  inch. The anterior part of the small intestines is widened till about a quarter of an inch from the pyloric valve, where ductus coledochus enters. Cæcum is very widened, more so than any other part of the canal, of a crescent shape.

GEN. *LOPHYRUS*, *Dumeril*.

Head triangular, more or less elongated, shelving in front; orbital edge arched or angular; nostrils lateral, circular, or oval; tongue papillary, rounded and very slightly notched at the point; in the upper jaw 5 incisors and 2 canines; tympanum superficial; skin of the throat lax, forming in some a scarcely perceptible, in others a highly developed pouch, and an angular cross fold in front of the chest; neck, trunk and tail compressed, with a crest, generally most elevated on the nape of the neck; scales of the trunk rhombic, subimbricate, unequal, (with scattered larger scales); femoral pores none.

*LOPHYRUS ARMATUS*, (Gray.)

SYN.—*Agama armata*, Gray.

*Calotes tropidogaster*, Cuvier.\*

*Acanthosaura armata*, Gray.

Orbital edge slightly angular, with a long spine at its posterior extremity; no spinous tubercles on the occiput; on each side of the nape of the neck, immediately above the ear, another long spine, surrounded with 5 to 6 shorter ones, at its base, from whence proceed obliquely over the temple and cheek a curved series of 18 larger polygonal, keeled scales; tympanum thick, circular; on the neck a crest of 8 to 12 long spines, surrounded with numerous smaller ones at the base; at a short interval the dorsal crest, the anterior 5 to 6 spines of which are very long, the rest rapidly decreasing towards the tail; gular pouch very small, not toothed, with scales of equal size; tail subtriangular, with a toothed crest above.

Above. Head chestnut; trunk and limbs blackish green, with a black transversal band in the interval between the cervical and dorsal crests, continued over the shoulders, with numerous pale yellowish white, black-edged, rounded spots, assuming the shape of transversal bands on the limbs and the tail; the larger single scales on the sides, limbs and tail clear sky-blue; from the orbit over the lip 5 to 6 radiat-

\* By mistake. *Calotes lepidogaster*, Règne anim. 1829. T. n. p. 39.



ing, black lines. Beneath yellowish white. Pupil circular, iris brown, with a narrow golden ring.

HABIT.—*Pinang, Singapore,*  
*Cochin China.*

At Pinang this species appears to be very local, and not numerous : two individuals examined were obtained from spice plantations in the valley. They were very active and fierce, possessed in a slight degree the power of changing the ground-colour to a lighter hue, and in captivity refused food and water. In a female were found 13 eggs of a yellowish white colour, of an oval shape,  $\frac{6}{8}$  inches in length. The stomach contained fragments of leaves and twigs, and a quantity of earth and lime. The latter probably originated from the lime water, with which the spice-trees are copiously sprinkled, to secure them against the attack of insects. The dimensions of the lizard were :

Length of the head, . . . . .  $1\frac{1}{8}$  inch.

Ditto ditto trunk, . . . . .  $3\frac{5}{8}$

Ditto ditto tail, . . . . . 6

Entire length, . .  $10\frac{6}{8}$

Of the intestinal canal :

Small intestines, . . . . .  $7\frac{4}{8}$  inch.

Large, . . . . .  $1\frac{6}{8}$

Cæcum, . . . . .  $0\frac{4}{8}$

The stomach capacious, with thick parietes. The first portion of Dnodenum is much widened till within half an inch from Pylorus, where Ductus coledochus enters. Cæcum is of a crescent-shape, much widened, as well as the large intestine.

#### GEN. DILOPHYRUS, Gray.

Head four-sided. Forehead rather concave, face-ridge high. Eyebrows rounded. Occiput with 3 or 4 larger tubercles on each side.

Parotids unarmed. Nape and back with a crest of high compressed scales, with series of smaller scales at their base. The throat rather lax,\* with a cross fold behind,† extending up the front of the shoulders. Scales of the back small, rhombic, equal; of the belly rather

\* Add : with a compressed pouch, minutely toothed in front.

† Questionable.

larger, smooth. Tail compressed, keeled and toothed above, with 2 series of elongated keeled scales beneath. Femoral and preanal scales none.

*DILOPHYRUS GRANDIS*, Gray. (Pl. XX.)

HABIT.—*Pinang Hills.*

Rangoon.

As the only published characters of this species leave its identity with the Malayan somewhat doubtful, they are here preposed.

*“Olive green; sides white spotted, beneath whitish; tail black-banded; head with lines of rather larger scales; crest very high, formed of broad compressed close-set scales, with 3 or 4 series of scales on each side of the base, interrupted over the shoulders.”* (Gray : *Catalogue of the Specimens of Lizards*, &c. p. 239.)

*Form.* The head is elongated, four-sided pyramidal, its greatest height and breadth being equal, and less than one half of the length. The muzzle is narrow, rounded, depressed. The upper surface of the head is very sloping, with a narrow furrow between the arched orbital parietes; the forehead depressed or concave. The scales are polygonal, keeled; those of the margin of the orbits and forehead larger, imbricate, forming a sharp ridge; four similar scales form a short ridge in the centre of the forehead, close to the muzzle. Behind the orbit, over tympanum, and on each side of the nape of the neck are similar short, oblique ridges, each composed of 5 larger pointed tubercular scales. The rostral shield is very broad, narrow, triangular; the mental, is much smaller, pointed, triangular, with two large polygonal scales on each side. The upper jaw is covered with 26, the lower with 24 elongated, narrow, rectangular scales.

*Dentition.*

$$\text{Incis. } \frac{6}{4}; \quad \text{Canin. } \frac{1-1}{1-1}; \quad \text{Molar, } \frac{14.14}{14.14} = \frac{36}{34}.$$

The incisors and anterior molars are very small; the latter gradually increasing in size, flat, sharply edged, bluntly tricuspidate. The tongue is thick, flattened, very slightly notched in front, the anterior half spongy, the posterior with large backwards pointed papillæ. The nostrils are nearly circular, pierced in a large oval scale, in front of which 3 scales intervene between the rostral. The eyes are large, sunk in the orbits; the pupil circular, black; the iris blue with golden

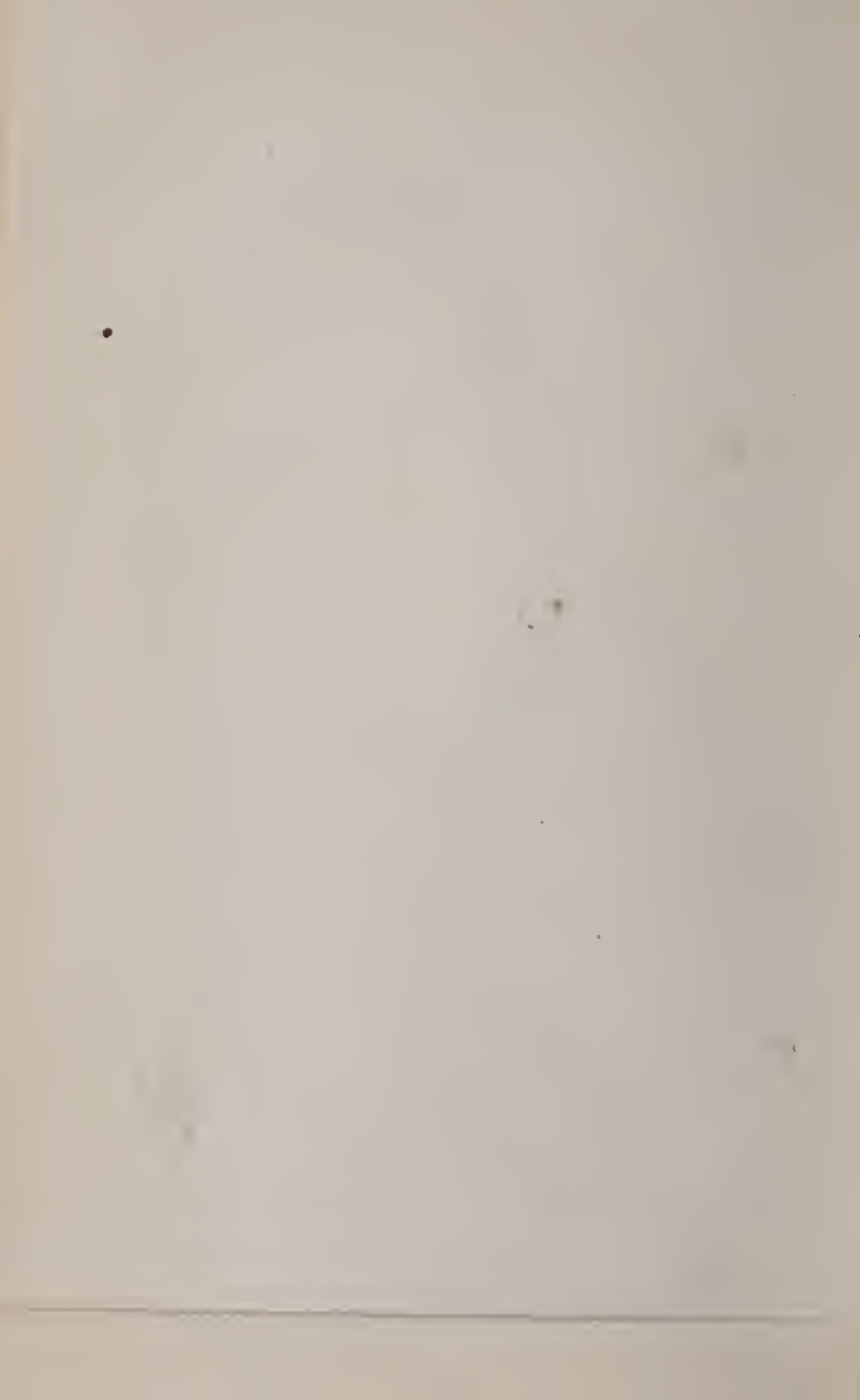
Pl. XX



DILOPHYRUS Grandis (Gray)

D. Cantor from life

T. Black. Lith. & Eng. & Engr. & Engr.



spots and a narrow ring. The eyelids are covered with very minute polygonal, tubercular scales. Each tarsus with a double row of scales, the inner one of small, polygonal, tubercular; the outer one of rhombic, flat, with the angles overlapping, so as to give the free margin a toothed appearance. The tympanum is large circular. The skin of the throat is very lax, forming a compressed pouch, the anterior margin of which is slightly toothed, owing to the series of scales overlapping each other. But there is during life no trace of any "crossfold behind, extending up the front of the shoulders." The scales of the neck and back are very minute, rhombic, or sub-rectangular, smooth, increasing in size and becoming imbricate on the sides, abdomen, limbs and throat. On the neck is a high arched, toothed crest, composed of 26 large ensiform scales, the 13 anterior gradually increasing in length, the rest decreasing. The base of the crest is supported by two parallel, slightly arched, series of rectangular scales, much larger than those of the rest of the body, but those of the upper series double the size of those of the inferior. The dorsal crest commences at a short interval a little behind the shoulders. In shape and component parts it resembles the former, but is double the extent, consisting of 45 scales, all of which however are inferior in height to those of the cervical crest, which, as well as the somewhat lower, sloping level, renders the dorsal crest less conspicuous than the former. The skin is somewhat lax on the sides of the body, leaving the ribs visible. The tail is very much compressed, attenuated, elongated. Its sides are covered with rather large, smooth imbricate, rhombic scales. The anterior third of the upper margin is toothed, composed of a single row of large, gradually decreasing, sharply keeled scales. The other two thirds are covered by two rows of keeled scales, thus giving the posterior part of the tail a bidentated appearance. The lower surface of the tail is covered by two series of large, gradually decreasing, imbricate, keeled scales, giving it a bidentated appearance. The limbs are slender; the anterior little more than half the length of the posterior, and the toes very short. The posterior 4th toe is excessively long. The palms and soles are covered with minute, pointed, rough scales; the toes above and beneath with sharply keeled, imbricate, rhombic scales. The claws are large, trenchant, curved.

*Colours.* The ground-colour of the head, neck, throat, gular pouch, and the chest is impure gamboge, the scales edged with brown. The eyelids dark brown, the tarsi buff. A dark blue triangular streak proceeds from the anterior angle of the orbit to the nostril; another is placed parallel with the upper labial scales, which as well as the lower are of a pale blue, as also the tympanum. From the labial scales and tympanum on each side across the throat, the pouch, and the sides of the neck, proceed 7 oblique, undulating, dark blue bands. The tympanum is enclosed by two oblique broad, purple-brown bands, which join each other under an angle at the anterior extremity of the cervical crest, where a third broad, longitudinal purple-brown band commences, proceeding over the side of the neck, then expanding, covers the back and the upper half of the sides of the body, where its lower margin describes two large curves. The lower part of the sides are of a deep lilac, changing on the abdomen to bluish white. On the sides of the body and on the abdomen appear several oblique series of lozenge-shaped spots: a few on the brown portion of the sides of a deep Indian red, the rest bright gamboge. The cervical and dorsal crests are mulberry-brown; the former with the upper half of each of the first 13 scales light green; the latter with the upper half of the first 10 scales pale yellow. The scales at the base of the crests partake of the general colour, but many of them have a pale yellow spot. The tail is above and beneath with alternate broad rings of impure white, the scales edged with brown, and purple-brown, changing to black on the posterior half. The legs, feet and toes are dark purple-brown with indistinct transversal yellowish bands.

*Dimensions.*

Length of the head, . . . . .	0 foot 2 inch.
Ditto ditto trunk, . . . . .	0 $4\frac{1}{8}$
Ditto ditto tail, . . . . .	1      4

Entire length, 1 foot  $10\frac{1}{8}$  inch.

Length of the cervical crest, . .  $1\frac{7}{8}$  inch; height of 13th scale,  $0\frac{6}{8}$  inch.  
Ditto ditto dorsal crest, . . . . . 3 inch; ditto ditto 15th scale,  $0\frac{1}{8}$

Length of humerus, . . . . . 1 inch; of femur, . . . . .  $1\frac{3}{8}$  inch.  
Ditto ditto fore arm, . . . . .  $1\frac{1}{8}$  of tibia, . . . . . 2  
Ditto ditto hand and 4th toe, 1 of foot and 4th toe,  $2\frac{1}{8}$


Entire length,  $3\frac{1}{8}$  inch.

6 inch.



The only individual examined, was captured on a botanical excursion by Sir William Norris on the Pinang Hills, on the bank of a mountain stream, at an elevation of about 2,000 feet. It appeared slow in its movements, of general sluggish habits, showed no power of changing colours, and in confinement it refused insects, vegetable food, as well as water. After having been preserved in rectified spirits of wine for upwards of three years, the specimen has retained the original brown and white colours and the Indian red spot; but the yellow, light-green and light-blue have changed to whitish, and the dark blue marks to blackish. Although the colours in this state do not agree with those given by Mr. Gray, apparently though not stated, taken from a preserved specimen, the peculiar distribution of the markings correspond, and induce me to believe in the identity of the animals.

GEN. DRACO, Linné, *apud Duméril and Bibron*.

Head triangular, obtuse in front, slightly depressed, covered with small scales of unequal diameter. Three or four incisors and 2 canines in the upper jaw. Tongue spongy, thick, rounded, entire.\* Tympanum hidden  in some, visible in others. In the centre of the throat an elongated vertical pouch; on each side a smaller horizontal. In general a small cervical crest.† Trunk depressed, with a lateral membrane, supported by the spurious ribs. No femoral pores. Tail very long, thin, angular, slightly depressed at the root.

A.—*Tympanum visible, metallic iridescent.*

DRACO VOLANS, Linné.

SYN.—*Draco volans*, apud Gmel., Latr., Gray.

*Draco præpos*, Linné, apud Gmelin.

*Draco major*, Laurenti.

*Draco minor*, Laurenti.

Le Dragon, Daubenton, Lacépède, Bonnat.

Flying Draco, Shaw.

*Draco viridis*, Daudin, apud Merr., Kuhl, Wolf, Wagler.


*Draco fuscus*, Daudin, apud Merr., Kuhl.

*Draco bourouniensis*, Lesson?

*Draco daudinii*, Duméril and Bibron.

“Chíchak terbang” or “Kubin” of the Malays.

\* In the following species the tongue is minutely, yet distinctly notched,

 i. e. *Dracunculus*, Wiegmann.

† The female of *Draco fimbriatus*, Kuhl, (i. e. *Draco abbreviatus*, Gray,) *D. volans* and *D. maculatus* differs from the male in having no cervical crest, and in having a smaller, less elongated gular pouch.

Scales of the back rhomboidal, imbricate, indistinctly keeled; of the throat granular, of equal size; the adult male with a small cervical crest; tongue minutely notched in front; gular pouch of the male very long, narrow, nearly double the length of the head; of the female shorter, broad triangular.

*Adult male and female.* Head metallic brown or green, with a black spot between the eyes. Back and inner half of the wing-membrane varied with metallic, iridescent dark brown and rose-colour, in some disposed in alternate transversal bands, with numerous black spots and short irregular waved or zigzag lines. Limbs and tail in some with rose coloured transversal bands. Sides of the neck and lips also rose coloured with black spots. Cheeks and eyelids silvery-white or sky-blue, the latter with short radiating black lines. Throat and gular pouch bright yellow, the former dotted with black; lateral pouches yellow or silvery rose, dotted with black. Outer half of the wing membrane black with indistinct transversal bands, composed of large, sometimes confluent, spots of silvery rose or whitish colour; the margins appearing as minutely fringed with silver. Beneath either whitish yellow or pale sky blue with metallic lustre; the membrane largely, the abdomen in some minutely spotted with black or brown. Iris hazel, with a golden narrow ring. *Young* of the same more vivid colours, with a series of double black spots along the spine of the back, and some scattered on the sides.

HABIT.—*Malayan Peninsula, Pinang.*

Philippine Islands, Borneo, Java.

The transcendent beauty of the individually varying colours, baffles description. Such as are current of this and other species, appear to have been taken from preserved specimens. As the lizard lies in shade along the trunk of a tree, its colours at a distance appear like a mixture of brown and grey, and render it scarcely distinguishable from the bark. Thus it remains with no signs of life except the restless eyes, watching passing insects, which, suddenly expanding the wings, it seizes with a sometimes considerable, unerring leap. It is but on close inspection, exposed to the light or in the sun that the matchless brilliancy of its colours appears. But the lizard itself appears to possess no power of changing them. This species is numerous on trees, in valleys and hills. The female, apparently less numerous than the male, car-



ries 3 to 4 eggs of an oval cylindrical shape,  $\frac{3}{8}$  of an inch in length, and of a yellowish white colour.—Of a number examined none exceeded the following dimensions :

Length of the head, . . . . .	0 $\frac{1}{8}$ inch.
Ditto ditto trunk, . . . . .	2 $\frac{1}{8}$
Ditto ditto tail, . . . . .	4 $\frac{1}{8}$
	<hr/> 7 $\frac{1}{8}$ inches.

B.—*Tympanum hidden by scales.* (DRACUNCULUS, Wiegmann.)

DRACO MACULATUS, (Gray.)

SYN.—*Dracunculus maculatus*, Gray.\*

HABIT.—*Pinang.*

Tenasserim.

*Form.* This species closely resembles *Draco lineatus*, Daudin, (*Dracunculus lineatus*, Wiegmann,) from which it differs in the following particulars. The adult *male* carries a very elongated, pointed gular pouch, double the length of the head, and a slightly elevated cervical crest, consisting of 6 to 8 pointed tubercular scales, and continued along the anterior half of the back in the shape of a ridge composed of a raised fold of the skin. The *female* has neither cervical crest nor dorsal ridge, and her gular pouch is much reduced, its length being about one half of the length of the head. Both sexes have the following characters in common. From each side of the neck commences a series of spinous scales, sometimes close together on one side, distant on the other, which, increasing in size and becoming more distant, continue along the side of the body, where they deviate outwards, marking the origin of the wings, and again converge towards the root of the tail, where they terminate. The scales of the back are generally smooth, consisting of smaller polygonal, mixed with some larger rhombic, indistinctly keeled, imbricate scales. In some individuals the latter are disposed so as to form a series on each side of the dorsal spine. The supraorbital margin has from 3 to 4 large pointed tubercles, of which but the one situated at the posterior angle appears

\* “ Grey, black-spotted; wings blackspotted; throat grey; pouch of the male elongate; scales of the back rather unequal, rhombic, keeled; of the sides rather smaller; sides with a series of large keeled scales; ears rather sunk, with unequal flat scales; tail slender, with a central keel above, and 5 more small ones on the sides, base dilated, with 5 nearly equi-distant equal keels above.” (*Catalogue of the Specimens of Lizards*, &c. p. 236.)

to be constant. The scales of the neck and throat are small granular, from which those covering the tympanum differ by being larger, flattened and polygonal. The tubercles of the throat and neck, and many of the scales of the back, wing-membranes, and the limbs, have each a minute rounded cavity at the point, discernible by a lens. The pouches, chest and abdomen are covered with rhombic, imbricate, keeled scales without apical cavities. Each jaw has 16 labial scales. The tail is long, very broad at the base, particularly in the male, suddenly tapering, rounded above, and covered with strongly keeled, imbricate, rhombic scales. The first large ones of the lowest series of the root form a more or less conspicuous toothed crest. The lower surface is flattened, with scales like the upper. The apex of the tongue is notched.

*Dentition.*

Incis.  $\frac{4}{2}$ , Canin.  $\frac{1-1}{1-1}$ , Molar,  $\frac{15.15}{15.15}$ .

*Colours.* This species bears so close a resemblance to *Draco volans*, that it is scarcely possible to point out any difference. The upper parts of the body are metallic greenish brown, varied with golden rose-colour or isabella, indistinctly dotted and lined with black. The wings are golden isabella with transversal black bands, formed by series of black rounded spots, either separate or confluent on the inner half, but blending into one another on the outer-half. In some individuals numerous undulating golden rose-coloured or buff lines longitudinally intersect the bands. The margins are finely fringed with silver. The limbs and tail are indistinctly ringed with black or brown. A black spot on the vertex, between the eyes, appears to be constant also in this species. The gular pouch and the throat are bright yellow, the latter in some dotted with pale brown. The chest and abdomen whitish yellow in some, bluish white in others. The under surface of the wings is of the latter colour, in some with single large rounded black spots near the margins, independent of the upper markings, which may be distinguished through the hemitransparent membrane.

Of this species but four, of which 2 males were received from Sir Wm. Norris. They were all from the Hills of Pinang;\* none exceeded the following dimension :

\* The Museum of the Asiatic Society possesses two females, obtained by the late Dr. Spry in the Tenasserim Provinces.

Length of the head, . . . . .	$0\frac{5}{8}$ inch.
Ditto ditto trunk, . . . . .	3
Ditto ditto tail, . . . . .	$5\frac{2}{8}$
	<hr/> 8 $\frac{7}{8}$ inches.

The intestinal canal of a female measured :

Small Intestines, . . . . .	3 inches.
Large „ . . . . .	$0\frac{7}{8}$
Cæcum „ . . . . .	$0\frac{2}{8}$

The capacious stomach contained remains of insects, particularly of the gigantic black ant, inhabiting the Malayan hill forests. The first portion of Duodenum is much widened till within a quarter of an inch from Pylorus, where Ductus coledochus enters. Cæcum is of a short crescent shape, much widened as well as the large intestine. In the abdominal cavity appeared 5 eggs, of an oval form, yellowish white colour, each half an inch in length.

GEN. *LEIOLEPIS*, Cuvier, apud Duméril and Bibron.

Head sub-pyramidal quadrangular with minute, polygonal, tubercular scales. Tympanic membrane a little sunk. Tongue scaly on the anterior, papillary on the posterior half, apex bifid. Chest with a transversal fold in front. Two canines in each jaw. Trunk sub-cylindrical with granular scales above; beneath with larger, smooth, imbricate, rectangular scales. Femoral pores. Tail conical, very long; the root broad and depressed, the rest excessively slender.

To these characters it will be necessary to add: *Skin of the sides of the trunk excessively lax, capable of being expanded into a large wing-like membrane by means of the six anterior, very long, spurious ribs.*

#### *LEIOLEPIS BELLII*, (Gray.)

SYN.—*Uromastix bellii*, Gray.

*Uromastix belliana*, Ill. Ind. Zool.\*

*Leiolepis guttatus*, Cuvier, apud { Guérin.  
Duméril and Bibron.

*Cynosaurus punetatus*, Schlegel.

*Leiolepis bellii*, Gray: Catal.

\* In the supposition that this incorrectly drawn and coloured figure has been taken from the living animal, M. M. Duméril and Bibron have been led to publish an erroneous description and figure. The last description of this species of Mr. Gray appears to be founded on the same authority. It runs thus: "Olive with black edged white spots and a black edged white streak on each side, beneath whitish." *Catal.*, &c. p. 263.

Ground-colour, above blackish-grey; the back and sides with 7 parallel lines of pale sulphur colour, edged with black, the 2nd from below, the 4th and 6th composed of more or less confluent spots, the other 3 of distant round spots. The expanded membrane black with 7 or 8 broad distant, transversal bars of a brilliant orange. The tail above with numerous small pale yellow spots. The forelegs with orange coloured rounded spots, some of which tipped with azure; the hindlegs minutely spotted with yellow. The throat pale azure; abdomen pale orange, marbled with broad bluish black veins; the tail beneath pale yellowish white. The lower eyelid is pure white; pupil circular, iris hazel with a narrow golden ring.

HABIT.—*Malayan Peninsula, Pinang.*

Cochin-China.

The head is covered with small elongated polygonal keeled scales; the upper jaw with 26, the lower with 18 to 20. The mental shield is elongated, polygonal; the upper part of the sides is joined to the first lower labial scale; the centre part is on each side in contact with the first of series of 13 to 15 elongated polygonal scales, which follow the tract of the labial, between which there is a narrow intervening space covered with smooth polygonal scales, larger than those of the rest of the throat. The back and wing-membranes are covered with minute granular scales; the abdomen with larger smooth rhombic scales. Those of the tail, above and beneath are verticillated, rectangular, subimbriate, and strongly keeled. The tongue is thick, fungous, not sealy as incorrectly represented, with the tip much flattened, free and slightly extensile, divided in two laterally compressed sharp points.—The molar teeth are tricuspidate, increasing in size, the anterior being the smallest. In the adult they are much worn and incrustated with brown tartar, like the teeth of *Semnopitheci* and *Ruminantia*.

*Dentition.*

Incis.  $\frac{4}{1-1}$ , Canin.  $\frac{1-1}{1-1}$ , Molar.  $\frac{12.12}{11.11}$ .

The nails are long, slightly arched, of a pale yellowish horn-colour.

The wing-membrane in a state of repose appears like a longitudinal loose fold, extending along each side from the axilla to the inguinal region. Expanded the external margin becomes arched, the trunk and the membranes forming a greatly flattened oval disk, (strongly contrasting

with the bulky appearance of the parts in a state of repose,) resembling the hood of *Naja*. The transversal diameter of the disk across axilla and the inguinal region is  $1\frac{1}{8}$  inch; across the centre  $2\frac{2}{3}$  inches. Like the mechanism of the Genus *Draco*, the membranes are expanded by means of the very long six anterior pairs of spurious ribs, which the lizard has the power of moving forward under a right angle with the vertebral column. The six posterior ones are excessively short, and though equally moveable, do not appear materially to assist in expanding the membranes. The latter are used as a parachute in leaping from branch to branch, after which they immediately resume their state of repose. Sudden fear, or anger will also cause a momentary expansion. The femoral pores are situated on a series of rather large rhombic scales on each thigh. In a number of twelve adult individuals, the pores varied from 13 to 19 on each thigh. In the specimens in the Paris Museum, described by M. M. Duméril and Bibron, there are from 20 to 24 on each thigh.

This species appears to be numerous, but local. Twelve were at one time obtained from a spice plantation in province Wellesley, some of which were in the act of changing the integuments. They were very active and swift, more so than their rather heavy make would induce to believe, and they would bite and scratch when handled, although among themselves in a spacious cage, they appeared peaceable, and patiently submitted to being trodden, or run over by a neighbour, about ascending the perch. The Malay, who brought the lizards, asserted they were frugivorous, and might be fed with soft fruit and boiled rice, which was perfectly true. In one immediately examined, the stomach and intestines contained rounded seeds of various kinds from the smallest size to that of a large pea, and vegetable fibres.\*

The rest refused insects and different kinds of fruit, but during the several months' confinement each would daily eat a little boiled rice, and occasionally take water. Of these none exceeded the following dimensions:

Length of the head, . . . . .	0	ft.	$1\frac{1}{5}$ inch.
Ditto ditto trunk, . . . . .	0		$\frac{4}{5}$
Ditto ditto tail, . . . . .	1		0

---

Entire length, 1 foot  $5\frac{3}{8}$  inch.

\* The latter, however, as well as sand and fragments of stones, also occur in carnivorous and insectivorous lizards, as well as serpents, which swallow these substances to stimulate digestion.



Length of the intestinal canal:

Small intestines,.....	5 $\frac{6}{8}$ inch.
Large ditto.....	3
Cœcum, .....	0 $\frac{2}{8}$

The stomach is of a lengthened pyriform shape, one inch in length; Duodenum, narrow, receives Ductus coleductus at  $\frac{3}{8}$  inch distance from Pylorus.—Cœcum is very short, nearly circular. The large intestine is sacculated, terminating in a short simple rectum.

There seems to be reason to believe that *Leiolepis revesii*,\* Gray, inhabiting "China" and Arracan, is also found on the Malayan Peninsula.

FAM. SCINCIDÆ, Gray, (LEPIDOSAURES, Duméril and Bibron.)

SUB. FAM. SAUROPHTHALMINÆ, Cocteau.

GEN. GONGYLUS, Wagler, apud Duméril and Bibron.

Nostrils lateral, pierced either through the nasal, or between the nasal and rostral shield; tongue notched, squamous; teeth conical, often slightly compressed, and as it were wedge-shaped, simple; palate toothed or not, with a posterior notch or a longitudinal groove; aurieu-

\* Syn. *Uromastix revesii*, Gray.—"Olive with a series of bright red spots on each side." (Griffith: Animal Kingdom, IX. p. 62.) Such was the only account of this species at the time of the publication of *Erpétologie Générale*, where it is not introduced. Mr. Gray's latest description runs thus: "Olive with longitudinal series of pale whitish spots; when alive blackish, with orange spots on the back, and a series of bright red spots on the sides.—China." (Catalogue, &c. p. 263.)

The Museum of the Asiatic Society possesses an adult male and a young specimen, sent from Arracan by Capt. Phayre. The form resembles in every particular that of *Leiolepis guttatus*, from which the present species principally differs by its colours, larger, heavier make and size. Each jaw is covered by 20 scales. From the mental scale proceeds a series of 10 larger scales on each side below the labial. On the throat appear 2 or 3 strong transversal folds, of which the anterior commences from the posterior margin of the tympanum. The tail is covered with keeled verticillate scales as in *L. guttatus*, but not with "rings of smooth scales" as Mr. Gray's generic character states.

Dentition.—Incis.  $\frac{4}{1-1}$ , Canin.  $\frac{1-1}{1-1}$ , Molar.  $\frac{10-10}{10-10}$ , Femoral pores 20.

Length of the head, .....	0 feet 1 $\frac{4}{8}$ inch.
Ditto ditto trunk, .....	0      6 $\frac{1}{8}$
Ditto ditto tail, .....	1      0
Entire length, .....	1      7 $\frac{1}{8}$ inch.

lar apertures ; four feet, each with 5 unequal, slightly compressed, not dentilated, nailed toes ; sides rounded ; tail conical or slightly compressed, pointed.

SUB-GEN. EUMECES, *Wiegmann*.

Nostrils pierced through the nasal shield, near the posterior margin ; 2 supernasal shields ; palate not toothed, with a rather shallow triangular notch behind ; scales smooth.

EUMECES PUNCTATUS, (Linné,) Var.

SYN.—*Lacerta punctata*, Linné.

*Stellio punctatus*, Laurenti.

*La Double raie*, Daub., apud Lacép, Bonnat.

*Lacerta interpunctata*, Gmelin, apud { Donnd.  
Shaw.  
Latreille.

*Scincus bilineatus*, Daudin.

*Scincus punctatus*, Schneider, apud Merrem.

*Seps scincoides*, Cuv. apud Griffith, A. K.

*Lygosoma punctata*, Gray, apud Griff. A. K.

*Riopa punctata*, Gray.

*Tiliqua cuvierii*, Cocteau.

*Tiliqua duvaucellii*, Cocteau.

*Eumeces punctatus*, Wiegmann, apud Dum. and Bibr.

*Riopa hardwickii*, Gray : Catal, (Young.)

Trunk individually varying in length ; limbs very small, giving the lizard a blindworm-like appearance ; tail very thick at the root, fusiform, tapering to a very sharp point, its length varying from one to two-thirds of the entire length of the animal. On the anterior margin of the ear a small tubercle. Above metallic chestnut, or greenish bronze, in some with 6 more or less distinct, dotted, black lines along the back, or with the two rows of scales nearest each side of a lighter shade than the ground colour, thus forming two lighter longitudinal bands. From the nostril to the middle of the side of the tail a black or brown band, with numerous small white spots on the sides. Limbs outside dotted with white. Beneath sulphur-coloured, in some the throat and tail minutely dotted with black. Iris dark brown, with a narrow, circular, golden ring.

HABIT.—*Malayan Peninsula, Pinang, Singapore.*

*Malabar and Coromandel Coast, Bengal.*



The Variety described above, is numerous in the Malayan countries, both on hills and in valleys. Of several the largest individual was of the following dimensions :

Length of the head, . . . . .	0 $\frac{3}{8}$ inch.
Ditto ditto trunk, . . . . .	2 $\frac{1}{8}$
Ditto ditto tail, . . . . .	1 $\frac{7}{8}$
Entire length, . . . . .	4 $\frac{3}{8}$ inches.

SUB. GEN. EUPREPIS, *Wagler*.

Nostrils pierced through the posterior part of the nasal shield ; two super-nasals ; palate with a more or less deep triangular incision ; pterygoid teeth ; scales keeled.

EUPREPIS RUFESCENS, (Shaw.)

SYN.—*Lacerta maritima maxima*, &c. Seba II, Tab. 105, Fig. 3.

*Lacerta rufescens*, Shaw, III, P. 1, P. 285.

*Scincus rufescens*, Merrem, apud { Cuvier.  
Gray in Griffith, A. K.

*Scincus multifasciatus*, Kuhl.

*Mabouya multifasciata*, Fitzinger.

*Euprepis multifasciatus*, Wagler.

*Tiliqua fufescens*, Gray.

*Eumeces rufescens*, Wiegmann.

*Tiliqua carinata*, Gray.

*Tiliqua affinis*, Gray, (Young.)

*Euprepes sebæ*, Duméril et Bibron.

Body strong ; limbs proportionate ; tail rounded, slightly compressed, little exceeding half the entire length. Scales of the back and sides : in the young with 5 to 7 keels ; in the adult the dorsal scales with 5 to 5 keels, the rest smooth. The anterior margin of the ear with 3 or 4 minute lobules. Lower eyelid with a series of 4 or 5 larger, square scales. Pterygoid teeth minute, few, hid in the palatal membrane, forming a short line on each side of the triangular incision of the palate.

HABIT.—Sandwich-Islands, Philippines, Timor, Celebes, Borneo, Java, Coromandel, Bengal.

VAR. D., Duméril and Bibron.

Above. Ground colour shining bronce with 5 to 7 zigzag, or dotted black lines, in some continued on the tail ; sides with many of the scales black, with a square white spot in the middle, in some arranged so as

to produce numerous, distant, transversal bands. The margins of some or all the shields of the head black. Beneath sulphur-coloured. Iris black with a golden circular ring.

HABIT.—*Malayan Peninsula, Pinang, Singapore.*

VAR. E., Duméril and Bibron.

Above uniformly shining bronze; sides in some sprinkled with blood red; rest like the preceding.

HABIT.—*Same localities.*

VAR. F., Duméril and Bibron.

Above uniformly shining bronze; the anterior half of the sides with a broad blood-red stripe, which in specimens preserved in spirits of wine changes to whitish, or disappears; the posterior part of the sides of the body and the anterior of the tail in some with square sky-blue spots in the middle of some of the scales; rest like the preceding.

HABIT.—*Same localities.*

These three varieties are exceedingly numerous in the hills and valleys of the Malayan countries. They may be seen basking in the sun, in bamboo hedges, or on trees, and they fearlessly enter houses in pursuit of insects, in which they display great agility. The female deposits 6 to 12 yellow white, oval, cylindrical eggs, half an inch in length. Nearly all have on the lower two-thirds of the tail a series of large scuta. In one individual observed the last two-thirds of the back of the tail was covered with a single series of very broad scales, of which each of the anterior had 15 to 16 keels. In another the tail had been lost near the root, and reproduced by a pyramidal, soft, naked process,  $\frac{3}{8}$  inch long, with circular folds like those of the body of *Ichthyophis*.—*Var. F.* appears to exceed the others in size: the largest was of the following dimensions:

Length of the head, . . . . .	$0\frac{5}{8}$ inch.
Ditto ditto trunk, . . . . .	$3\frac{1}{8}$
Ditto ditto tail, . . . . .	$4\frac{1}{8}$

Entire length:  $8\frac{5}{8}$  inch.

EUPREPIS ERNESTII, Duméril and Bibron.

SYN.—*Seineus ernestii*, Boie, MSS.

*Psammite* de Van Ernest, Coctean.

*Dasia olivacea*, Gray: Catal.

Form like *E. rufescens*. Triangular incision of the palate very small, with a few minute pterygoid teeth on each side. Ears obliquely oval, small, appearing more so being half covered by two of the temporal scales; no lobules on the anterior margin. Scales of the back with minute, longitudinally waved lines, and from 3 to 8 indistinct keels. The outer half of the toes and the nails sharply compressed. A series of scuta beneath the tail.

*Very young.* Head light green bronze, shields edged with black and a black line, edged with silver, from the muzzle to the ear. Back, sides, root of the tail and outside of the limbs shining black with numerous transversal, waved, silvery lines. Feet and toes rose, or flesh-coloured. Tail brilliant scarlet.\* Throat, abdomen and inside of the limbs silvery white.

*Adult.* Ground colour greyish-brown bronze. Frontal and supra-orbital shields black edged; fronto-parietals, inter-parietals and parietals black, each with a whitish elongated mark, united, forming a symmetrical figure. From the nostril to the eye a black streak. Neck and body with a number (12 to 14,) of distant, transversal, waved bands, composed of black scales, each with a rectangular white spot in the middle. Outside of limbs with 4 or 5 similar bands. In some a buff coloured lateral band on the posterior part of the back, and the anterior half of the side of the tail. Beneath iridescent light bluish-green; scales with whitish edges. Iris black with a golden narrow circle.

HABIT.—*Malayan Peninsula, Pinang.*

Java.

In habits this species resembles *Euprepis rufescens*, but appears to be far less numerous. In a female were found eleven eggs, in shape, size and colours resembling those of *E. rufescens*. The young, above described, was of the following dimensions:

Length of the head, .....	0 $\frac{3}{8}$ inch.
Ditto ditto trunk, .....	1
Ditto ditto tail, .....	1 $\frac{6}{8}$

Entire length: 3 $\frac{1}{8}$  inch.

\* The very young of *Eumeces lessonii*, Dum. and Bibr. (*Scincus cyanurus*, Lesson,) is distinguished by a similar distribution of colours.

Of the two adult individuals the large measured :

Length of the head, .....	$0\frac{6}{8}$ inch.
Ditto ditto trunk, .....	$3\frac{2}{8}$
Ditto ditto tail, .....	$4\frac{4}{8}$

Entire length :  $8\frac{1}{8}$  inches.

SUB-GEN. *LYGOSOMA*, Gray, *apud Dum. and Bibr.*

Nostrils pierced through the nasal shield ; no supranasals ; palate toothless, with a small triangular incision, situated far back ; scales smooth.

*LYGOSOMA CHALCIDES*, (Linné.)

SYN.—*Scincus pedibus brevissimis*, &c. Gronov. P. II, No. 43.

*Lacerta chalcides*, Linné.

*Angvis quadrupes*, Linné, *apud Hermann.*

*Le Chalcide*, Daubenton.

*Der Vierfuss*, Müller.

*Lézard vert à écailles lisses*, Vosmaer.

*Lacerta serpens*, Bloch, *apud* { Hermann.  
Gmelin.  
Leske.  
Donnd.  
Shaw.

*Angvis quadrupède*, Lacépède.

*Chalcida serpens*, Meyer.

*Lacerta serpens*, Donnd, *apud* Shaw.

*Scincus brachypus*, Schneid. *apud* Merrem.

*Chalcides serpens*, Latreille.

*Seps pentadactylus*, Daudin.

*Seps* (*Angvis quadrupes*, Lin.) Cuv., *apud* Griffith, A. K.

*Mabouya serpens*, Fitzinger?

*Lygosoma serpens*, Gray, *apud* { Wagler.  
Griffith, A. K.

*Lygosoma aurata*, Gray, *apud* Griffith, A. K.

*Tiliqua de Vosmaer*, Cocteau.

*Lygosoma brachypoda*, Duméril and Bibron.

*Podophis chalcides*, Gray : Catal.

Blindworm-like ; limbs excessively small ; tail strong, conical, about two-fifth of the entire length. A single large lozenge-shaped fronto-parietal shield. Ear minute, circular. Lower eyelid scaly, with a few larger scales. Preanal scales larger than the rest.

Ground colour : iridescent lighter or darker copper, or bronze, in some with indistinct dark brown zigzag lines, produced by the scales being laterally edged or dotted with that colour. Beneath pale or whitish yellow. The tail in some minutely dotted with brown. Iris black with

a minute golden ring. The supraorbital scales being somewhat transparent, the black colour of the eye gives them a blackish appearance.

HABIT.—*Pinang*.

Singapore, Java.

But two individuals were observed on the Great Hill of Pinaug, one by Sir W. Norris, the other by myself. The latter made its appearance through a hole in the soft, moist mould beneath a group of *Polycopodium horsfieldii*. Above ground its movements were very quick, serpent-like, apparently little assisted by the tiny limbs. The head of the larger measured  $\frac{2}{8}$  inch, the trunk  $2\frac{7}{8}$  inches in length. One had but 4 toes on the anterior feet. In both the tail was reproduced, which is also the case in a third, from Singapore, preserved in the Museum of the Asiatic Society.

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*On the Temples and Ruins of Oomga, by Capt. M. KITTOE, 6th N. I.*

As occasional notices of the nooks and corners of Hindoostan may prove interesting to many readers of the Journal (notices that it must be in the power of many of the Civil and Military servants of Government and others to furnish and at little cost), I venture to set the example by offering the following description of a locality once famous in the province of Behar, called Oomga, situated within a mile of the dawk Bungalow of Mudunpoor, and fourteen west of Sheerghatti, a visit to which will ever repay the lover of the antique and picturesque for his pains.

The object which first strikes the traveller is the lofty conical tower of a Temple perched on the westernmost and lower spur of a cluster of hills to the south of the Benares road, the rock composing which is a very coarse grained (porphyritic?) granite affording materials for this and all the other Temples (said to be 52 in number) of however small dimensions.

The height of the great Temple from the rock to the crest may be about 60 feet, the extreme length from east to west is 68ft. 6in. and the breadth 53.



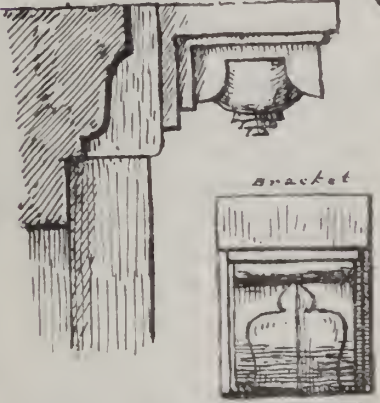
pillar in the great tank 22' 2"



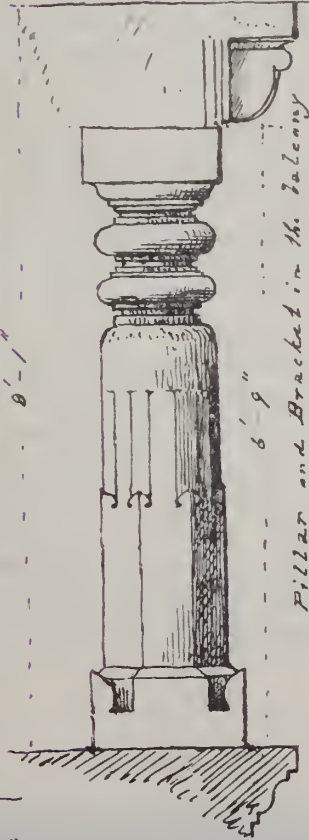
1'-10"



Bracket & Section over door



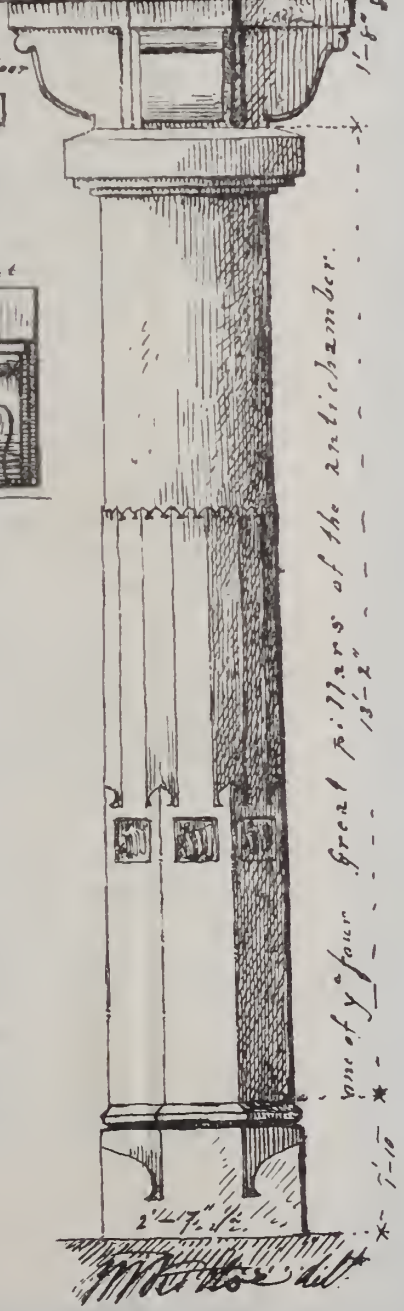
Bracket



8'-1"

6'-9"

Pillar and Bracket in the balcony



one of 4 great pillars of the antichamber.

13'-2"

1'-10"





As this structure is perfect I prepared the annexed ground plan with an elevation of the eastern entrance and of two of the pillars, brackets, &c. These will give a better idea than I could convey in writing; the north and south balconies or porches being both alike, I have given the ground plan of the lower of one, and of the upper story of the other; the date of this edifice is found in a Sanscrit inscription I shall treat of further on.

The exterior shape is that common to most buildings of the kind erected between the 12th and 15th centuries of the Christian era, of which so many fine specimens are to be found in the province of Cuttack: the materials being very hard and coarse-grained would not have admitted of minute ornament, consequently such is confined to bold mouldings and recesses producing the usual and pleasing effect. The interior is nearly as devoid of ornament as the exterior.

The Temple being dedicated to Jugnath (as "Narain") has no idols, but a Singhasan or throne on the west wall (facing the east), on which the wooden blocks representing the triad of Sri Jee, Bulbudra and Seubudra were formerly placed, but is now occupied by fragments of other figures—there are also two of Ganesh in the ante room or Subha.

The pillar or Garura-stamba which formerly supported Garadu, still stands on the space in front of the entrance, and is about 14 ft. high, a single block of granite.

The four large columns in the Subha are likewise single shafts 10 feet each, or capitals and bases included, 16ft. 8in.  $\times 2\frac{1}{4}$  in thickness; their shape will be observed is that common in Hindu architecture, viz. 1st portion square, 2nd octagon, third 16-sided, and fourth circular, the capital being likewise circular and surmounted by four armed brackets or corbets.

A remarkable feature in this Temple (to which its preservation from the destructive hand of Mahomedan fanatics may be attributed) is its bearing cufic inscriptions over the entrance doorway, as well as those of the two small chambers, also on the eight sides of each pillar and on the architraves, the latter consist simply of the word "Allah." The former appear to be extracts from the Koran, but having been chiselled off it is nearly impossible to make them out. This piece of mischievous folly, I regret to record, is attributed to a European officer, at whose suggestion the late Rajah Gunsam Sing of Deo caused it to

be done, and the words "Ramjee," "Sri Ram," "Sri Ganesh," "Sri Jugnath," "Bulbudrajee," &c. &c. have been scratched in common Nagree to supply their place, as his European friend suggested that it was not right to allow Mahomedan badges to remain in a Hindu Temple: however, his having at the same time recommended substantial repairs which were executed, may be considered as some slight set-off to such outrageous folly.

The next object worthy of notice is a large slab of chlorite containing the long inscription before mentioned, recording the building of the Temples, and other great works which surround it. This I regret to state is said to have been taken from its proper site by another indiscreet officer with the intention of carrying it away; it has been lying out of doors trodden under foot and used as a whetstone till very much injured; I have had it set upright within the Temple, where I hope it will be preserved. I offered two years ago to have it properly fixed, but the young Raja of Deo, like all his kindred, made excuses owing to some absurd suspicion of my intentions, a suspicion which pervades all alike, and is the greatest bar to finding such valuable records of bygone times and events. The Raja informs me that a fine slab was taken from the Deo Temple by some gentleman (name unknown) many years ago to Benares. I have had one verse given me that the Brahmins know by heart, only that they have added several zeros to increase the date; this may give a clue to what has become of it. Shame upon such mischievous spoliation!

The view from either balcony of the Temple is very extensive and beautiful; two prettier landscapes could not be seen in any country—from the south the visitor looks down on the site of the deserted and ruined town of Oomga, with its magnificent tank and high square mound surrounded by a (now) dry ditch, once the Noor or palace of Byrub Indra, the founder, and subsequently of the Oomga Chiefs, the last of whom, Purbeel Singh, was attacked by the emperor (name unknown), his town and palace sacked and laid in ruins, and himself taken to Aurungabad, a town 14 miles further west, and there blown from the muzzle of a gun.

The Tank is now much choked with mud, and in the hot weather dries up, it is about 300 yards long by 200 wide, has a sluice in the centre of the northern face which empties into an extensive "Ahur" or

reservoir covering many acres of ground, the banks of which as well as those of the Tank, formed part of the town enclosure and defences : on the east side in the centre and opposite the palace, is a fine Ghat or flight of stone steps—there is also an elegant pillar in the centre of the tank, about 20 feet high, a single block of granite, the capital not included. The Tank “Ahur,” and city walls (nud), had, till three years back, fine bamboo hedges which are now no more, for strange to say, the whole blossomed and bore seed like rice, after the ripening of which the plantation died, though it is said to have existed for several centuries—it was expected that fresh shoots would spring up, but such has not been the case.

About five hundred yards further west is another fine Tank, 200ft. square, and it is much to be regretted that these as well as many other fine reservoirs in the district are allowed to fill up without an attempt to clear them, a labour which would be amply repaid in a few years. This remark is more particularly applicable to many of the noble Tanks in the north-west provinces built by the emperors of Dehli, and their ministers. Surely a little encouragement on the part of Government and of the Civil functionaries in districts, wealthy individuals might be induced to bestow a portion of their hoardings on undertakings which would perpetuate their names ; it would cost far less to repair such tanks than to dig and construct others of a fraction of their dimensions, and be of greater service—though I believe that there exists a prejudice against repairing the works of others—the result of false pride, but no doubt were encouragement given a sounder feeling would arise.

The fort of Oomga has been very injudiciously placed, for although the hills which command it were impracticable for artillery, still wall pieces and small arms would be used against it with deadly effect.

The hills are, as I have before said, covered with small temples, chiefly to Mahadeva and Ganesh ; the natural hollows at the top have been converted into reservoirs, beside one of which is an idol called Oomgeswuree, to which goats and buffaloes are sacrificed ; a fair is also held once a year.

Although we learn from the flowery Sanserit verses that Bhyrub Indra built temples, dug tanks and wells, &c. I am convinced that the spot has been dedicated to the worship of Mahadeva and his emblem, the Lingam, for centuries previous to the advent of that chief, for some of

the Linga are very ancient and have been covered in with brickwork. Bhyrub Indra appears to have had great power in this province, and to have expended much wealth in building Temples. There is one at Deota Surya (the sun), and another to the same deity at Kooch near Takuree, 14 miles north-west of Gya, mention of which is made by Buchanan, whose notice the present inscription as well as the locality appears to have escaped. It is surprising that an indefatigable inquirer should have learnt or said so little of a person whose name and exploits are so well known in the district. Nevertheless the name is not to be found in any of the lists of dynasties published by Prinsep; hence we may infer that he was some powerful usurper in the early part of the 15th century during the reign of the Puthan emperor Mohummed Shah the Sumbat date given in 1495, A. D. 1439, in the light half of the month of Vaisakh, which seems from the many inscriptions I have collected to have been a favorite period of the year for dedications of the kind.

Since writing the foregoing I have been favoured, through the kindness of a gentleman of known acquirements, Seyed Azmud Deen Hossein, Deputy Collector of Behar, with the following translation of two lines of the Cufic inscriptions, which I had almost despaired of being ever decyphered: they clearly allude to the event handed down by the tradition I have alluded to; a victory is recorded, but by whom still remains doubtful. The longer inscription over the great doorway most probably contained both the name of the conqueror and the date of conquest; we can only then lament the more the act of folly which has deprived us of the information; the next sentence *نَصْرٌ مِنَ اللَّهِ فَتَحَ بِشِيرٍ قَرِيبَ* only differs in the word *بعونه* instead of *بشیر* the literal meaning of which Azmud Deen gives as "By the help of God Victory is gained," though perhaps some might construe it thus "By the help of God Victory is nigh at hand."

I send also a rudely executed inscription from the walls of the Sooruj Mundir at Deo, which my draftsman tells me is executed in plaister; the date is Sumbut 1605; the Temple is said to be very perfect; I only regret I have no leisure to prepare a drawing, which would be useful. I suspect that the great inscription, plundered as before stated, must have been dedicated to some deity other than "Surya" or the Sun as

the door faces the west instead of the east; it may have been a Budha Temple. In the verse of the inscription given by the Brahmins Budda as the son of Iln is mentioned. Divesting the figures given of the string of zeros, we have the dates 1293 Sumbut, or A. D. 1239, by the original inscription, and A. D. 1548 or S. 1605, in that now sent, which for the first gives a difference of 202 years earlier than the Oomga Temple, consequently it could not have been built by Bhyrub Indra as related.

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*On the Gamboge of the Tenasserim Provinces, by the*  
*Rev. F. MASON, A. M.*

In conversation with a distinguished medical officer, and member of the Asiatic Society, I found that he was not at all aware that the Tenasserim Provinces produce Gamboge. It has therefore occurred to me that a brief notice of the Gamboge of these provinces might not be unacceptable to the readers of the Journal, and would contribute its influence to draw attention to a most interesting portion of the British Provinces in the east; one that is exceeded by few in the richness and variety of its natural productions.

Three works in my possession describe Gamboge each as the product of a different tree; a fourth represents all to be wrong, and a fifth suggests a different plant, still. One refers it to *Cambogia gutta*, a plant which, as described by Linneus, has probably no existence. He described a Ceylon plant, and it is now quite evident, says Dr. Wight, "that the character of the flower and ovary is taken from one specimen, and that of the fruit from a different one, owing to the imperfection of his specimens, and his not being aware that the lobes of the stigma afford a sure indication of the number of cells of the fruit."

Another refers it to *Garcinia cambogia*, but Dr. Wight says that the exudation of this tree is "wholly incapable of forming an emulsion with the wet finger," a statement which the writer knows to be correct. The tree is very common in the Tenasserim Provinces, but the bright yellow exudation it produces is certainly not Gamboge.

A third refers it to *Stalagmitis cambogioides*, but Dr. Wight remarks "The juice of this tree differs so very widely in its qualities from good Gamboge, that it can never be expected to prove valuable as a pigment."



Dr. Graham has described a Ceylon tree under the name of *Hebradendron cambogioides*, which is said to produce good Gamboge; but no Gamboge has ever been exported into the English market from Ceylon. Thus it would appear, to use the language of Dr. Wight, that "the tree, or trees, which produce the Gamboge of commerce is not yet known."

Dr. Helfer who was employed by government as a scientific naturalist in these Provinces, at an expense of *thirteen hundred* rupees per month, reported "the Gamboge of this country dissolves very little with water, and consequently does not yield that yellow emulsion as the common *guttifera*. It will never serve as a color, but promises to give a very beautiful varnish." This statement was controverted by a writer in our local periodical at the time, who said he had obtained "fine Gamboge of the very best description" from our jungles; in which he was no doubt correct, but he erred when he added that it came from the "true *Stalagmitis cambogioides*." A very small amount of botany would have served to preserve him from falling into this error; for that plant has a quinary arrangement of its flowers, while the arrangement of the flowers in those that produce Gamboge in these Provinces is quaternary.

The hills that bound the valley of the Tavoy river, on both sides, from their bases to their summits, abound with a tree which produces a fine Gamboge. It is Roxburgh's *Garcinia pictoria*, which he knew produced Gamboge, but which he said was liable to fade. As soon as I satisfied myself of the identity of the trees by an examination of the inflorescence of our plant compared with Roxburgh's description, I colored a piece of paper, one band with this Gamboge, and another with the Gamboge of commerce; and subsequently exposed both to the weather equally for more than twelve months, but without being able to discover that one faded any more than the other. South of the latitude of the mouth of Tavoy river, and throughout the Province of Mergui, there is found on the low plains at the foot of the hills, and on the banks of the rivers, almost down to tide waters, another species of *Garcinia* that also produces good Gamboge. I have no doubt but it is the tree from which Dr. Griffiths furnished Dr. Wight with specimens, and which the latter says, "I refer doubtfully to Wallich's *G. elliptica*." We will call it then *G. elliptica*, a species which Dr. Wight has

on his list of "species imperfectly known." The foliation and female flowers are however, very well described, and to complete the description, I may add the male flowers are pedunculated, but the peduncles are shut, and they might be characterized as sub-sessile. The anthers, like those of the female flowers, are sessile, depressed or flattened above, and dehisce circularly. The ripe fruit is globose, and not furrowed. As I send along with this paper specimens of both the male and female flowers, any of your botanists will be able to correct me at a glance, if I be in error.

Neither Wallich, Wight, nor Griffiths appear to have been at all aware that this species produces Gamboge. Dr. Wight, in a recent number of his *Neilgherry plants* says, "Two species of the genus *Garcinia* are known to produce Gamboge, most of the others yield a yellow juice, but not Gamboge, as it will not mix with water." The species which he has described as producing Gamboge, and to which I suppose he refers, are *G. Gutta* or *II. Cambogioides*, (Graham,) and *G. Pictoria*, (Roxburgh.) That others may be enabled to judge of the character of the Gamboge produced by this tree, I have the pleasure to send specimens of its exudation. In its appearance to the eye, and in its properties as a pigment, I have failed to discover the slightest difference between it and the Gamboge of commerce. It serves equally well to color drawings, the Burmese priests often use it to color their garments and the Karens to dye their thread. It is also used by the native doctors in medicine, but I think not extensively. Dr. Lindley, in his new work the "*Vegetable Kingdom*," says:—"The best Gamboge comes in the form of pipes from Siam, and this is conjectured to be the produce of *Garcinia Cochinchinensis*." As *G. elliptica* is spread all over the Province of Mergui, is it not probable that it extends into Siam, and that the Siamese Gamboge is the produce, a part at least, of this tree?

There are several other species of *Garcinia* indigenous to the Provinces, but I know of no others producing any thing resembling Gamboge, except *G. Cambogia*; the exudation of which, though it will not dissolve in water, dissolves in spirits of turpentine and forms a very beautiful yellow varnish for tin and other metallic surfaces.



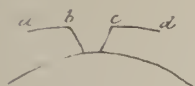
*On a Sculpture from the Site of the Indo-Greek city of Bucephalia ;  
by Captain JAMES ABBOTT, Boundary Commissioner, &c.*

Herewith I have the pleasure to enclose you a drawing of a sculptured red freestone, dug from the Site of the Indo-Greek city of Bucephalia on the Hydaspes, by, I believe, General Ventura, and now lying in front of the castle of the present city of Jelum. It is one of many relics disinterred from time to time, in searching for bricks, all those used in Jelum being thus derived. The tracery is evidently Greek ; for there is no such design to the best of my belief in Hindoo sculpture, and it seems to have been the lintel of a temple to Ceres or to Bacchus. Many Indo-Greek coins are found in the same spot, and it is here that the Empire seems to have found its eastern limit. The sculpture is in good preservation owing to having been buried so many hundred years. Its style is as decidedly Grecian, as its outline, being altogether deeper and more massive than that of the Hindoos, although I am not sure that it has any advantage in delicacy or grace. The square panels upon the pilaster, seem to me Hindoo ; but both the lozenge and the ellipse are Greek or Egyptian, as is the Thyrsus, if I rightly designate as such the two undefaced figures of the beading. I do not know whether the maize represented in this sculpture was known to the Greeks previous to the conquest of Alexander ; but it seems probable that Osiris, whose conquest of the Punjaub appears almost as well authenticated as that of Alexander, must have brought it with him from India, if indeed he did not first introduce it there. It seems to me that I have met with it in sculpture brought from Greece. Other portions of the same temple are said to have been removed by General Ventura. I shall not omit any opportunity of observing them, should I return to Lahore, where they are supposed to be. This fragment is very massive, being about six feet in length and 20 inches thick. If you consider it worth removal, which I should doubt, it could be conveyed by water free of expense to Ferozpoor or Ludiana.

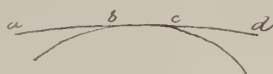
My professional duties have so little leisure for transcribing sketches that I have found it impossible to complete this until now. Meanwhile, on a visit to Aknoor, a town on the right bank of the Chenab, where it debouches from the mountains, I was attracted by the novelty



*Figure in a Temple to Kamdeo at Aknür*



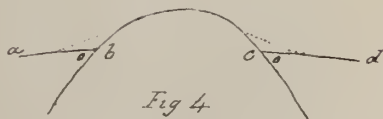
*Fig. 1*



*Fig. 2*



*Fig. 3*



*Fig. 4*



of a temple to Kam Deo or Cupid. The building, a recent obelisk, had fallen in, and the supposed statue of the deity had been removed into a modern Seebwala or Temple of Seeb close by, this temple being a facsimile of the most modern of the Mohammadan Tombs.

The figure is about 2 feet high, carved upon a dark stone (lime apparently) and in good preservation.—A sketch is enclosed. I was immediately struck with the outline of the club, as precisely similar to the club of the Grecian Hercules and entirely different from the mace of Hunnoomaun or the club of Hurr, the Indian Hercules. Its figure is graceful and the knots represent exactly in three touches of the chisel the stumps of branches roughly lopped away. All the rest of the figure appears to me rather Egyptian than Hindoo. The thick under lip, the teeth developed, the heavy ringlets falling upon either shoulder, the precision with which the perspective is preserved, and the minute development of every joint and member, so that even the finger nails are correctly chiselled. Unfortunately the head is broken away above the mouth; but from the impression left upon the stone it must have been unusually high. It appears to me to be a figure of Osiris in the joint capacity of Bacchus and Hercules. But, whatever it be, it is the indubitable original of the figures of Hunnoomaun, so common in upper India; that is, the peculiar bend of the body in this statue has been copied in the rude representations of the Monkey-God. The only drapery is the Hindoo dhotie, well and deeply cut. The most perplexing circumstance is the presence of the Junnoo or sacred thread worn by Brahmuns and Rajpootres. This is beautifully chiselled, but I was not aware that it was in use amongst the Egyptians. If not, it may have been added when their descendants had become naturalised in India. You are aware that there is a city upon the Indus bearing the name of Bacchus Lyah, and that Alexander met with the descendants of his followers upon that river. Although the club is so decided a facsimile of that of the Grecian Hercules, there is nothing else in the figure breathing of the Grecian chisel. The muscles are not developed. The hero has not been elevated by art into the character of a demi-god, but remains a clumsy mortal, and appears to be an imitation of the original, carried to a minuteness which distinguished the Egyptians, but which I have never observed in Hindoo sculpture. The left arm had been broken away so that I am uncertain whether the second left

arm belongs to this figure, or to another which has been grouped with it. The latter opinion seems more probable, as there is no articulation for a second arm upon the left shoulder, and no symptom of a second arm on the right. The second left hand presents a bunch of grapes or a custard-apple. The leaf accompanying is more like that of the latter fruit. It will be remembered that the custard-apple is to this day called *Seeta-phul*, (*Seeta's fruit*,) because she fed upon it whilst wandering in the woods. It is a native of the *Dukhun*. This second hand is beautifully sculptured. The foreshortening is perfect. This circumstance seems to strengthen the analogy between the *Raam* of India and the *Raam* of Egypt. Unfortunately the statue is still an object of worship, so that I could not make free with it. There is an ancient site close to *Aknor* from which are dug the bricks of the present city. But all my endeavors to procure coins or relics were fruitless, and I doubt whether this image could have been found in its ruins, as the Indo-Greek empire seems to have been bounded eastward by the *Jelum*, and it is not probable that the Egyptians spread themselves farther eastward. On either side the mouth of the figure are horizontal lines apparently representing thin tufts of hair, as in some Chinese figures.

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*Additional Observations on the Damask Blade of Goojrat ; by the same.*

A few observations suggest themselves in addition to the account I had lately the pleasure to send you, of the fabric of the *Goojratie Damask*. It appears to me upon second thoughts that the figure of the mass of cast steel may be selected by design, though probably hit upon originally by accident. For if we follow the arrangement of the needles of crystallization from the mass into the blade, we shall perceive that the edge of the latter is a serrated spine of these needles, radiating from the elongated ellipse into which the centre has been drawn. And as the power of swords, knives, razors, &c., to sever soft substances, depends upon the serration of their edge, we have here the finest and most perfect natural saw that can be imagined, justifying the half marvellous records of feats performed with *Damascus* blades.

This property being inherent in the structure of the crystallization is not liable to be effaced by accident or use. The acuteness of the wedge may be blunted, but the teeth of the saw cannot be destroyed.

That this arrangement of the crystals is not disturbed by the action of the hammer, we learn from the water of the blade and from the seam remaining inclosed in the back.

It follows that however perfect the edge of the natural damask may be, it must always be especially liable to cross fracture at that point where the radiation of the crystals is perpendicular to the edge of the blade. And accordingly Asiatics use such sabres with extreme caution, not ordinarily striking with them but drawing the edge lightly and swiftly over any unguarded part: a touch sufficing to disable; or severing their adversary's reins; a practice which renders necessary the use of chains upon the bridle to the distance of 18 inches from the bit.

The natural damask therefore seems ill-adapted to the purposes of war as practised by European nations, but seems especially suited to the fabric of razors, penknives and surgical instruments, in which keenness of edge is of the first consequence and elasticity of none.

The art of giving elasticity to the cast steel or natural damask is a secret known only to the discoverer, Col. Anosoff of Engineers, Master of the Fabric of Arms at Zlataost. The knives, &c., warranted to be of cast steel, and professing considerable elasticity, which are common enough in England, are made of blistered steel, which bears that appellation amongst us, but is not bonâ fide cast steel, having never been in a state of fusion.

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*On the Local and Relative Geology of Singapore, including Notices of Sumatra, the Malay Peninsula, &c.—by J. R. LOGAN, Esq.*

(Concluded from page 557.)

*Extract from a letter to Professor Ansted, Vice-Secretary of the Geological Society of London, dated Malacca, 4th February, 1847.*

“Subsequently to the date of the above paper, finding that but a slow and unsatisfactory progress could be made by land, I availed



myself of the natural vertical sections afforded by the shores of Singapore, and the smaller Islands, into which the southern extremity of the Peninsular range is broken, and was thus soon in possession of a body of facts which gave a certainty and consistency to the above views. I minutely examined the Islands of Púlo Brání, Blákan Mátí, Sikúkúr, and Sikíjáng on the one side, and Púlo Ubin, Púlo Tikong, Bæsár, Púlo Tikong Keelíl, Sejáhát Bæsár and Keelíl, &c. on the other side. I also explored the neighbouring coasts of the Peninsula, and the banks of the Johore river. The result was that I found the foregoing hypothesis, so far as it had been developed, to be substantially an expression of the facts. It had however given too much prominence to some modes of the volcanic or semi-volcanic action, and too little to others. Thus, although there has been a certain degree of eruption in some cases where the gases in forcing their way to the surface have excited an unusual mechanical force, their action has, in general, been limited to a partial reduction and metamorphosis of the rock in the zones or dykes through which they have passed up [or in those larger tracts beneath which the surface of the plutonic sea has risen to such high subterraneous levels that the whole superincumbent matter has been saturated by its exhalations. I have also noticed several facts which appear to require us to believe that some portions at least of Singapore, were under water at the time when the gaseous action first reached the surface. The vast abundance of hydrated peroxide of iron and the mode in which ancient ferruginated breccias and conglomerates sometimes occur, would be most simply explained by this hypothesis. The circumstances adverted to in the paper on this subject must be borne in mind. In some places a considerable quantity of matter derived from the hills has been deposited in the intervening valleys, probably at or soon after the time of elevation, and been subsequently covered up by modern sea mud on which mangroves have rooted and spread.]

The most difficult branch of the enquiry has been the relation between the volcanic action to which the sedimentary rocks have been subjected, and the crystalline rocks which are associated with them. But, disregarding this for the present, and considering the volcanic action apart from any hypothesis of its origin or its relations, and reasoning from its visible effects, we may lay down this position absolutely, that the whole region in question (and a much wider one, as it



will be found, extending to the lower ranges of the Himalayas, a large part of Australia, a part of Africa, &c.) has been exposed to a well marked and peculiar, perhaps a unique,\* igneous action. It has varied in its intensity and mode of operation, but every where certain prevailing characters demonstrate its unity. These are both chemical and mechanical, the first depending principally on the never failing presence of iron, and the latter evinced by the extraordinary uniformity in the shapes, ramifications and even sizes of the ranges in which the rocks affected have been raised. Whatever be the nature of the original sedimentary strata, this mighty agent has impressed them with the same marks, and the more powerful its grasp has been the more have their native peculiarities been confounded. But between the effects of this intensest force and that so weak that we barely detect its touch, the degrees are almost infinite. Still the only way in which I can render this slight immethodical sketch at all intelligible, will be to note

\* This I had been very slow to believe, because although there may be places where a fossil fauna or flora altogether peculiar is found, it is scarcely conceivable that any plutonic action should have an entirely local character, or that one repeated over so many parts of an extensive region in Asia, should not hitherto have been observed by Geologists in Europe or America. I have however, read nearly every English work on Geology without meeting a description of any considerable development of rocks in those quarters of the globe resembling our laterites, and have consequently been obliged to work out their true theory with little help from books, and by dint of patient and minute observation. A few months ago I was led to think that English writers were too much occupied in establishing their own opinions to present a full view of those of continental Geologists, and that the latter were leaving them behind in the science of rocks of injection, reduction and eruption. It appeared necessary therefore to gather their views from their own explanations of them. In the first work which I ordered, and which I received two days ago by the Overland mail, I found an allusion to a district in Europe, which has been described by an eminent French Geologist, and which, if I may judge from the few lines in which it is referred to, must be in many respects analogous to the lateritic tracts of the Malay Peninsula, and consequently of India, &c. also. In a few months I hope to have the means of ascertaining whether this is the fact, and also whether in the writings of other continental Geologists any similar tracts are noticed. A few days ago Mr. Balestier, put into my hands a letter which he had received from one of the gentlemen attached to the recent French Embassy to China, a pupil of the celebrated chemist Dumas, in which he explains the views of himself and another member of the embassy on the Geology of Singapore. His theory of the origin of the laterite had occurred to me when I first began to suspect its real nature. As my observations extended and became more minute, I found that such a theory only explained a small part of the phenomena, and that which I have now held for about 2 years, gradually developed itself, growing clearer and simpler in proportion as it embraced wider ranges of facts.—J. R. L. 16th March, 1847.

a few of the better marked disguises which the rocks assume under this potent influence. I say disguises, because the geology of the Malay Peninsula almost wholly resolves itself into the identification of the original rock under its multiplex transformations. Without a key to this, derived from a minute examination and comparison of the modes of alteration, the whole is a dark riddle, or our geology becomes a congeries of bewildered gropings and sheer mistakes.

The first or lowest degree of alteration, let us say in a clay, is the formation of isolated blotches of a reddish colour in the rock, but unaccompanied by any other apparent change.

2d. A slight comparative hardness in the blotches.

3rd. In addition a grittiness,—they may now be termed nodules or concretions, and we may include in this catalogue all degrees from an incipient grittiness to a hard compact character, which gives the nodule the appearance of an imbedded pebble; [the nodules are sometimes hard and compact without being gritty or quartzose, and they are gritty in their nascent state where the rock is originally arenaceous in any degree.]

4th. The nodules bulge out at different points, and the preceding three degrees may be repeated in nodules of this shape.

5th. The arms or branches unite so that the rock is pervaded by a complete congeries or ramification of red, rounded, but irregularly shaped, branches. The form of these branches varies very much, but is generally uniform for a considerable space. Very frequently it is as if ginger roots were continued in all directions. At other times the spaces between the ramifications are narrow sinuous perforations or isolated vesicles or deep straight tubes or chambers in tubes. This structure is sometimes the result of an allied or predisposing structure in the rock affected, and at other times, it appears to be wholly superinduced by the altering agency. In this last form the red portion is found of various degrees of hardness, but not so soft as the first degree. In general it possesses a medium degree of hardness so as to be cut with an axe.\*

6th. In this class we may include the products all degrees of heat that has been suddenly applied in sufficient force to produce calcination, and this distinguishes it from all the preceding, in which the

\* It hardens on free exposure to the atmosphere and is used in building.

rock has been merely impregnated with hot ferruginous gases or vapours—where the calcination has not been great the original structure of the rock is better preserved than in the merely impregnated rock, because, in the latter, the incalcrating action of the iron, the different degrees of its oxidation when it comes within the influence of water and air, and the washing out of the softer portions in the hollows, often give it an amygdaloidal or vesicular structure totally different from that of the original rock—a slight roasting on the other hand preserves the latter and saves it from meteoric destruction. The limit of this preserving power is soon reached, and every higher degree of heat and larger infusion of iron exerts in each rock, a corresponding destructive or altering power, and approaches nearer that point where the original differences in the rocks cease to be distinguishable. The extreme limits of this class appear to be where the rock is merely scorched on the surface, preserving its original character beneath, and where it is thoroughly reduced to a cinder. This class of rocks very frequently presents mamillated and botryoidal surfaces. It occurs in dykes, and on the sides of fissures through which hot blasts appear to have rushed. It also occurs in an outer layer or thick crust over rocks of the 5th class, in which case it would appear that the different effects produced by the same gas arose from the upper crust being exposed to the air and consequently burnt. In the same way the calcination to some depth on the sides of fissures may have arisen in certain cases, not from the gas that rushed through them being hotter than that in the body of the rock (though this was most likely the fact in general) but from the presence of air producing combustion. Between dykes of this last class rocks altered in the above 5th degree are common—but dykes of the 5th degree also occur. The difference in every case will depend on the relative intensity of the heat and degree of ferrugination of the gas, and the fact whether there was air to support combustion or not.

The preceding remarks are applicable chiefly to rocks either composed of clay or in which there is a basis of clay. But a very small proportion of clay suffices for the exhibition of the above modes of action. When the rock is wholly arenaceous, nodules are not formed. The rock is reduced to a dry incoherent or friable mass where the action has been slight. Where it has been greater, a net work of cracks

pervades the rocks, and the seams have either a thin plate of blackish ferruginous crust included between them, or their sides have a similar thin coating which is often covered with an exceedingly minute mamillation. In some cases the matter between the seams or ferruginous walls, has been dissipated, and the rock appears as a black honeycomb. In all instances of high calcination the sandstone is greatly indurated. It is sometimes converted into a crystalline rock.

Friable shales, again, are sometimes changed into a dry powdery matter resembling volcanic ash.

Where the bodies of the strata are not altered their planes of junction are sometimes slightly indurated and mamillated. The gas in every case has taken the readiest channels to the surface,—and where fissures have not assisted its emission, it has forced itself through the planes of least cohesion, such as the junction planes of different beds, cleavage planes, &c. It thus often exposes the internal structure of the rock where it would otherwise appear compact. The composition of the rock has often had a great influence in determining the channel of emission, so that its action sometimes is chiefly confined to one or more strata, the adjoining beds appearing to be little if at all affected.

Quartz frequently accompanies the ferruginous change, but rarely to a considerable extent.

The above are the most common modes of alteration, but there are others approaching nearer to true metamorphism. Clay is converted into a porcellainous or jaspideous substance,—sandstone into a hard siliceous flinty substance. Conglomerates and breccias have frequently a base of this nature.\*

The mechanical force accompanying the evolution of the hot ferruginous gases or vapours has been great, but it has been exerted within narrow limits. Thus the strata are often vertical, and generally rise at high angles, but the dip varies much, and even in adjacent hills of the same connected range is sometimes reversed. Yet they are never raised more than a few hundred feet above the common basal level, and the majority of the almost innumerable hillocks which compose the ranges of Singapore, are probably rather under than above 100 feet.

\* I have since found on the eastern coast of Pálo Krímún Kichí (the Little Carimon) great masses of clays and conglomerates transformed into a perfect crystalline chert as hard as flint.—J. R. L.

At the southern extremity of the western St. John's (Pulo Sikijang) two adjoining hills have been formed by strata being bent into a convex shape—rising only a few feet above the level of the beach. There is a remarkable approach to uniformity in the strike of all the strata and in the direction of the hill ranges. Speaking generally, it may be said to approximate to N. W.—S. E. The hills have commonly mamillary surfaces. The ranges may be said to consist of distinct hills bulging out and united at their sides. The central hills are generally the more bulky. Lateral hills ramify on each side to a short distance. The whole connected system is disposed in a symmetrical ramose manner, indicating a wonderful uniformity in the mode of operation of the dynamical forces which produced them. The investigation of the forms of these hills, and of the laws of the mechanical forces of which they are the result, assumes a high interest and importance when we find that these forms are not confined to Singapore, but are repeated in low hill ranges over large portions of the Peninsula, Sumatra, Southern India, Northern India, Northern Australia, &c., and accompanied, as I believe, by volcanic phenomena of exactly the same nature as those which I have described. I do not say that the phenomena are identical at all points. In Singapore itself they vary almost infinitely. But they are always analogous, frequently the same, and, to my mind, are undoubtedly the product of one well marked species of volcanic\* action.

I should not omit to notice the frequent occurrence, in those ranges which have been most *burnt*, of mounds or monticules of scoracious blocks, sometimes on the summits, and sometimes bulging out from the sides of hills. The ridges and angles of hills appear frequently to present scoracious blocks.

The valleys between the long hill ranges are, in Singapore, perfectly flat, so that they display the outlines of the bases of the ranges almost as well as if they still remained what they were at no very remote

\* In reference to the igneous changes which the rocks have undergone, I use the words volcanic and plutonic indiscriminately, because a minute examination of some of the best marked developments of crystalline rocks (graduating from basaltic to granitic types) at the extremity of the Peninsula, has led me to think that though the distinction is useful and appropriate in some regions, the theory which it expresses is not sound as a general one—at least as expounded by many Geologists.



period, long narrow inlets of the sea. This circumstance also is not confined to Singapore.

I will now briefly notice the nature of the sedimentary rocks which have been more or less altered and elevated in the modes I have mentioned. If you think it worth while, you can, I dare say, procure a copy of Mr. Thomson's Chart of Singapore straits from the Admiralty for reference. It would scarcely be advisable at present to attempt to make a geological map. The southern portion of the Island (including the town, the adjacent district to the N. W.; the ranges between the road from the town to Búkit Tímáh, the central and highest hill, and the sea to the S. W.), and the Islands of Blakan Mátí, Púlo Brání, St. Johns, &c., are composed of shales, clays, sandstones and conglomerates, the shales predominating. It is impossible to refer these rocks to any place in your European systems, as no organic remains have yet been discovered, and the only rocks with which they are associated are hypogene. In their general appearance and mineralogical characters they agree with the aluminous and arenaceous beds of the new red sandstone. Between the parallel of strike passing through the town and the steep Tulloh Blangan range, there is an area about a mile in breadth, stretching from the sea inland over the Tanjong Pagar and Tanghir districts, and of course in a direction approaching to N. W., and in the opposite direction, including Púlo Brání and the eastern portion of Blakan Mátí, composed in great measure of shale strata, although a few of sandstone also occur. The prevailing colours of the shale beds are dull violet, liver brown and chocolate. Beds of the most lively variegated colours sometimes occur mottled, striped, damasked, &c., the colours are white, yellow, orange, red, violet, purple, green, bluish and blackish, in addition to the dull violet and chocolate. To the N. E. of this tract sandstone is more frequently interstratified. To the S. W. sandstones, grits, and coarse conglomerates prevail; and these are continued, interstratified however with some shales, from the range along the coast of Tulloh Blangan through the western portion of Blakan Mátí, and through Sikúkúr and Sikijáng (St. Johns), in a S. Westerly zone. I have not yet pursued this zone further across the strait, but the Island of Sámbo, on the other side, is a continuation of the same parallel of elevation, and may consist of the same rocks. To the N. E. of the town, a large alluvial plain sweeps into the coun-



try. The hills around it are principally arenaceous. The arenaceous band however on the N. W. of the plain merely skirts it. Beyond this band (and succeeding the sandstone ranges to the N. E. of the shale tract first noticed) a broad zone of clayey hills, of which the boundaries are irregular, but which may be from 3 to 4 miles in breadth, stretches through the heart of the Island to Bukit Timáh, and ~~thence~~ across to the Sálát Támboh or old strait of Singapore behind the Island. The tract to the S. W. of this, stretching from the parallel of the S. W. boundary of the shale band to the S. W. point of the Island (Tanjong Gál), is composed principally of sandstone and shale, but granitic bases and ranges also occur. The great clay tract I believe to consist in large measure of decomposed hypogene rocks,—sienitic and granitic chiefly, (it has only however been partially examined or laid open). Blocks of these rocks are seen at the surface in some of the hills, and the sections made by roads so exactly resemble decomposed crystalline rocks that I have no doubt that the whole of the clay hills are at bottom hypogene rocks. Their structure and composition I believe to be very variable. This tract is continued over a considerable part of the rest of the Island to the N. E., but a large tract of sandstone (accompanied by a very little shale) stretches into it. The coast boundary of this tract is a line of about 4 miles, extending along the south eastern shore of the Island from Síglap to beyond Tánáh Merá Besár (the Red cliffs). It insulates the granitic N. E. projecting portion of the Island at Changy, embraces the northern coast from the inner extremity of this promontory to the inner extremity of that of Púngal, and then proceeds inland. The line of its junction on the N. W. with the granitic tract that surrounds it I have not yet ascertained, but it is probably irregular. On the S. W. it connects itself with the arenaceous band surrounding the plain previously mentioned, and, indeed, forms the larger portion of the boundary of the plain. It then stretches inland for some distance, having the S. E. projection of the great granite tract interposed between it and the arenaceous and shaley bands, first above noticed. P. Ubin is entirely hypogene, varying from granitic to compact types. Hornblende is largely developed. The structure of the rocks is highly curious and interesting. I have given much attention to this Island, and in the beginning of September last sent a full account of it, and of the geological views to which it

seemed to lead, to the Bataviaasch Genootschap van Kunsten en Wetenschappen, in whose Transactions, the President writes me, it will appear. In this paper I had been led to some views with which I find Mr. Darwin had been occupied, and which are developed in the chapter on plutonic and metamorphic rocks in his geological observations on South America, of which, though bearing the same date as my paper, I did not receive a copy till about a fortnight ago. The germ of his ideas is however contained in his Volcanic Islands, which I have referred to in my paper. As I have also considered the subject from some other, and, as I believe, new points of view, I shall send you a copy of the paper in English, the Batavian Transactions being in Dutch.\* The coast of the mainland behind P. Ubin consists of rocks some of which would be called plutonic and others volcanic like those of Pulo Ubin, but the whole are undoubtedly of the same contemporaneous origin. At Runto, in the estuary of the Johore River, sandstone, similar to that of the Singapore Red cliffs, and, like it, remarkable for being nearly horizontal, is exposed. Further up the River the rocks exposed are of a decomposed felspathic character, and exactly resemble some of those of the hypogene tract of Singapore. At one place a hard ferruginous crust about 9 inches thick overlaid a decomposed felspathic rock. Pulo Tikong, Besar and Keehil, consist chiefly of sandstones and in part of shales, often greatly altered by volcanic action. On the coast to the S. E. near Johore Hill, or at Tanjong Pingrang, are found, within a small compass, soft shale or clay,—clay indurated so as to resemble, or become, chert,—conglomerate highly indurated and partially transformed,—quartz rock,—and traces of blackish brown slags,—indicating various degrees, and even some difference in the mode of the volcanic action.

The connection between the crystalline and sedimentary rocks of the district is susceptible of two explanations. We may either consider

\* In a general descriptive sketch of some portion of the Straits of Malacca which I sent to the Geographical Society some time ago, I mentioned the singular grooved rocks at the Chinese Quarries on P. Ubin, and hazarded some conjectures respecting their origin—when I wrote that paper I had made only one flying visit to the Quarries and was under the impression that the deep channels were confined to this locality. My first geological visit subsequently at once undeceived me. In the paper forwarded to the Batavian Society, I have *shewn* how these channels have resulted from the original structure of the rock under ordinary decomposing and eroding influences.

the former in their fluid or viscons state as having been the immediate agents of the volcanic and mechanical forces to which the latter have been subjected, or we may consider the former as the product of the first plutonic action beneath this region; the latter as sedimentary rocks subsequently accumulated [over them] during a period of quiescence, and their fracture, upheaval, and alteration as the effects of a new excitement\* to activity in the plutonic sea below, in which the old plutonic crust, with its sedimentary covering, was broken and upheaved, and ferruginous or ferro-siliceous gases copiously emitted through the lines of fracture. On either supposition the ferruginous character of the emissions would be accounted for, because the upper granites, &c. contain much iron in their hornblende, and whether the mass below the granite crust, had remained in its fluid state during the deposit of the sedimentary rocks, or had been wholly solidified and subsequently melted down anew, the gases given off from it, when vents were formed, would probably preserve the same character as those given off from its original surface before any granitic crust had been formed. I cannot stop now to explain how the prevailing plutonic theories, as applied to the phenomena of the district, seemed, at the time when the paper first mentioned was written, to require the adoption of the opinion that the granites, &c. were in existence when the volcanic action took place. Even under the influence of these theories I considered the point as very doubtful, and, although it involved consequences irreconcilable with these theories, I ventured to hazard the conjecture that the upper hypogene rocks had been the immediate agents of the changes. The examination of Pulo Ubin shook my faith in these theories as expounded by some of their principal advocates, and the conjecture assumed a high degree of probability. Latterly I had all but embraced it, but still suspended its complete adoption in the hope that I would discover some phenomenon amounting to ocular proof of its truth.

I have only another point to advert to before I come to Malacca. If you have taken any interest in Indian Geology, you are doubtless acquainted with the rock called laterite which prevails so largely in southern India, and is also found in Bengal, &c., and which, to this day, remains the most fertile subject of discord amongst Indian Geologists, although the general opinion appears of late to have settled down in favor of its being a sedimentary deposit. In the paper first alluded to in

this letter I made the following remarks with reference to laterite :—  
 “Many of the clayey hills here [in Singapore] appear to me to be decomposed sienite, sometimes unaltered by supervening volcanic action, but generally partaking in the metamorphism which the matter of most of the elevated land has suffered from that cause.”

May I venture to suggest that the hypothesis which is developed in this paper for Singapore, might, if applied to the laterite of India, perhaps explain its origin, and, in doing so, to a certain extent also reconcile the conflicting opinions that have been maintained regarding it. All that I have read of the great laterite formations of the south of India, and which extend to the heart of Bengal, where they are described by Dr. Buchanan Hamilton, leads to the conclusion that they are not purely volcanic, sedimentary, or decomposed matter, but what I have termed semi-volcanic. The same formation is found at Malacca, and analogous deposits occur at Singapore, and both are inseparably associated, and evidently contemporaneous, with altered rocks of the kind previously noticed. If we conceive an area with trap, granite, sandstone, shale, &c. exposed at the surface, (in the atmosphere or in the sea,) and partly decomposed or disintegrated, to be subjected to a peculiar species of minor volcanic action like that which is described in this paper\* (*the distinctive phenomenon, probably, of one and the same geological epoch*), the results would be, that with the occasional exception of matter ejected from no great depth, and some dykes and veins, the previous soft surface rocks would be merely altered and metamorphosed by heat and impregnated with iron, derived perhaps from the basaltic and other ferri-ferous rocks through which the discharged steam, gases and water had passed in their ascent. Whether the action took place under or above the sea would be determined by the presence or absence of the ordinary marks of oceanic denudation. When clays strongly ferruginous and soft from saturation with water, are dried, the iron previously held in solution by the water is deposited between the particles and cements them into a hard compact rock. Hence the

\* Whether the upper plutonic rocks were the direct sources of the igneous action, or were themselves, together with the sedimentary rocks acted on by a lower plutonic sea, does not affect my explanation of the formation of laterites; for whether I adopt the one or the other view of the source of the injections and impregnations which produced the laterites, or remain in doubt on the subject, the fact, deduced from the actual examination of these rocks, that they have been so produced, is not at all rendered doubtful.



induration of laterite clays on exposure to the atmosphere." My opinion therefore was that though proper laterite was nothing more than one of the forms of alteration produced by plutonic ferruginous gases,—that which, in the arbitrary scale formerly given, I have called the 5th degree,—and that any rock in which a sufficient quantity of clay was present, whether it were purely sedimentary or a decomposed crystalline or compact rock, or whatever its origin or character in other respects was,—would, on being exposed to certain degrees of impregnation by such gases, and under the conditions before adverted to, become *laterised*. This opinion was abundantly confirmed by later observations, but these also proved that iron alone was capable of producing rocks of a lateritic form. The result therefore was that although proper laterite is produced in the mode which I have mentioned, yet that mode is not essential to the formation of a lateritic structure. The only essential thing is the diffusion of iron in ramifications throughout a clayey rock. Get the iron so diffused, and it is of little consequence by what door it was introduced. The only distinctive quality of proper laterite is that it has not merely got the iron, but has been, in various degrees, baked in the process of impregnation, and close examination can always discover traces of this. On the other hand, iron may be introduced by aqueous saturation, and if the soft rocks so saturated have planes of inferior cohesion, as many rocks have, the iron will there accumulate. If the iron solution pervade a homogeneous clayey rock as water does a sponge the segregating or concretionary quality of iron so diffused may gradually draw it into connected nodules or ramifications; and indeed it is probable that in all cases of volcanic gaseous impregnation of the compact parts of rocks the ferruginous matter remained for a time diffused throughout the rock, and that this segregating tendency subsequently superinduced its contraction into ramifications and blotches. Where the gaseous impregnation was weak, it would speedily draw into isolated blotches,—where stronger into isolated concretions,—where strongest, and the heat not too great, into ramifications. Again the iron may be laid up in the heart of a crystalline rock solidified from a plutonic fluid holding iron, and the essential condition for the production of the laterite structure may be found in decomposed hornblendic, or even black micaceous granites that have not been subjected to any supervening volcanic action. The oxidation

of iron solutions in clays on exposure to the air, and the combustion of rocks by heated ferruginous gas are chemically related, and the product of these two processes, geologically so widely sundered, is sometimes difficultly distinguishable by the eye. Ancient conglomeritic and brecciated laterites and ferruginous rocks, appear to have been formed in many localities at, or soon after, the period of the ferruginous emissions by fragments or pebbles settling down in a sandy or clayey base saturated with ferruginous water. Similar conglomerates, breccias and sandstones are at present forming along the coasts where the hills or banks above contain much iron; but all these are very obviously distinguishable from the original plutonically laterised sedimentary rocks.

When I visited Malacca about two years ago I had paid very little attention to these subjects and had not formed the preceding views. When an opportunity occurred at the beginning of last month of revisiting the place, I eagerly seized the occasion of testing these views in a new locality, and one which had been described by Geologists, such as Captain Newbold, and Dr. Ward, familiar with the much vexed laterites of southern India. Captain Newbold, in his work on the Straits describes the Malacca hills "as being generally of granite with the exception of a few near the sea coast, which are of laterite overlying the granite. Specimens of hornblende rock have been brought to me, he continues, from a hill a little south of Malacca—the islets on the coasts are of granite of various kinds, with white, red and green felspar. In all, the felspar appears to be predominant, and mica deficient." Dr. Ward says of the Malacca laterite—"In all its properties it agrees exactly with the rock common on the Malabar coast and described by Dr. Buchanan under the name of laterite." I was now therefore, for the first time, in a position to bring my theory to the strongest test, for I had not seen any specimen of Indian laterite, and could only compare some of the apparently analogous Singapore rocks with it from descriptions. Captain Newbold, in one of the latest of his numerous papers on the Geology of Southern India, describes very minutely the often mentioned laterite of Beder and makes some remarks on the long debated question of origin. He combats the idea that it is a contemporaneous rock associating with trap, or a product like trap of igneous fusion. He also casts doubt on the theory, advocated by several Geologists, of the laterite being "nothing more than the result of the recent disintegra-



tion of the granitic and trappean rocks *in situ*," and, without giving a decided opinion, says "the beds of lignite discovered by General Cullen and myself in the laterite of Malabar and Travancore and the deposits of petrified wood in the Red Hills of Pondichery, in a rock which, though differing in structure, I consider as identical in age with the laterite, and other facts too long for enumeration here, points rather to *its detrital origin like sandstone*."\* (*Journal of the Asiatic Society of Bengal*, Vol. XIII. p. 995, 1844.) Mr. Darwin, I may mention in passing, seems to lean to a similar opinion with respect to analogous rocks noticed by him. "The origin of these superficial beds," he says, "though sufficiently obscure, seems to be due to alluvial action on detritus abounding with iron." (*Volcanic Islands*, p. 143).

The first lateritic locality which I visited on my arrival here was the Island of Pulo Uppa, from which much laterite has been removed for building purposes, and where it continues to be cut. The first fragment which I knocked off the rock at once satisfied me that my theory was correct. It was a rock totally different in its original character from any which I have found at the southern extremity of the Peninsula, but which, by the same agency that altered the ordinary sedimentary rocks there, had been transformed from a common argillo-micaceous schist into a rock undistinguishable, save on minute inspection, and, where the alteration has been great, absolutely undistinguishable from some of the altered sedimentary shales and slates of Singapore. Upon careful examination I found, as I expected, in the sections afforded by the coast of this little islet, the original unaltered micaceous rock with great bands or dykes and overlying masses, exhibiting abundant varieties of transformation from a rock slightly discoloured by the ferruginous action through several lateritic types, to the calcined slaggy form in which the original composition and structure are wholly obliterated. I cannot enter into further particulars. My subsequent examination of about fifty miles of the coast from Pulo Arang Arang (P. Arram) southward, and of a portion of the interior of Malacca, has proved that the whole of this region has been originally composed in a great measure of the same argillo-micaceous schist. I shall hereafter give

\* I have read all Captain Newbold's papers with the attention which they deserve, and I think every fact which he notices in his notes on laterite tracts is reconcilable with the theory which I maintain.

its numerical characters, for I have not time nor means at present to ascertain them carefully. It is soft and glistening like silk, and leaves a powder on the fingers which exactly resembles in appearance the fine glistening powdery down from a butterfly's wing. In some cases it is less dry and more argillaceous. With the exception of Cape Rachado\* it has almost everywhere been more or less penetrated in bands (and broad spaces occasionally) by ferruginous gas which has transformed it into one or other of the forms before described or some intermediate forms. Dykes and veins of pure quartz and of quartz with numerous fissures filled with an iron crust are frequent in some localities, while in others they are wanting. Wherever these dykes and veins occur the foliation of the schist is much contorted. In some localities the surface is covered with black shining mamillated scoriaceous blocks passing down into a lateritic mass, in which the schist is often not greatly altered but is penetrated by ramifying dykes and veins of a ferruginous, quartzose, or quartzo-ferruginous character. Isolated pseudo-crystals and isolated plates of quartz occur in the schist in some places, and, on the other hand, patches of the schist are found in the hearts of large pieces of quartz. But it would require other 20 pages to give even an outline of the varied and irregular manner in which the rock has been altered. If we did not everywhere come upon portions of the original rock unaltered, or find traces of it in the altered tracts, it would be almost impossible to believe that all the varieties of the latter have had a common origin. I must briefly allude to Cape Rachado. This is a bolder and higher range than any found elsewhere along the coast and projects far into the Straits. It is the only locality which I have yet seen where the quartzose has predominated over the ferruginous action of the plutonic gases. The rock everywhere exhibits unequivocal evidence of its having been originally the same argillomiceaceous schist which prevails over the rest of the region. In some places the cliffs are almost wholly quartzose,—in others the rock is a congeries of quartz veins and foliæ,—in others the seams between the quartz foliæ have a coating of the original mica,—in others the original mica predominates and the quartz is more sparingly scattered through it. Broad dykes of compact quartz, of quartz mixed with a ferruginous crust, of numerous parallel veins with quartz crystals springing from

\* Where the plutonic action has been of a silicifying more than a ferruginating nature.

their sides and the interstices filled with a black ferruginous substance sometimes dull and sometimes shining (apparently hydrated oxide of iron) and of quartz holding a similar substance in seams also occur. One of the largest and boldest cliffs has been converted into a compact siliceous rock pervaded by numerous quartzose and ferruginous dykes and veins. In some places a complete net-work of fissures ramifies through the rock, and it is evident that quartzo-ferruginous gas or vapour has been injected through these fissures and the large veins and dykes, and metamorphosed the rock.

At the Water Islands south of Malacca, and at Tanjong Panchur and Bndewa to the north, I carefully examined some large developments of granitic rocks. In the former I found some dykes composed of quartz felspar and a ferruginous substance similar to that already noticed. In decomposed felspar and also in solid quartz in those dykes I found much both of decomposed and of undecomposed iron pyrites. Although these dykes seem to countenance the idea that the plutonic agency which has so greatly affected the superior rocks was exerted after the formation of the upper granite, I have from all my observations come to a different conclusion. I cannot now state its grounds, and I do not positively bind myself to an opinion to which perhaps I cannot demonstrate beyond doubt to be correct, but the result of my constant consideration of the subject in all its relations, and with reference to every new locality that I have explored, is as follows:—The whole region has been subjected to plutonic reduction. The plutonic fluid by its pressure has caused fractures in N. W. S. E. lines, and it has swollen up in ramifying bands having that general direction. Its pressure and heat have varied at different portions of its surface. In some places the heat has been so intense as to reduce all the superincumbent rock up to the very surface into its own substance, and it has swollen up into mountains in the interior and hills in the exterior lateritic tracts of the Peninsula.\*

\* This is opposed to prevalent theory, and it may be asked whether in that case it would not have flowed over? But I have found it impossible to apply the prevalent plutonic theory,—I mean that of a necessarily *Tartarean* origin of granite, &c.,—to the granites of the south of the Peninsula, considered even *per-se*, and I would ask in return whether there is any proof or probability that granite prior to solidification ever exists in the upper crust of the globe in any other form than as a viscid cohesive mass. Let Fig. 1, Pl. XXII. be the surface of a plutonic bubble swelling up and reducing

The transformed and partially transformed sedimentary hill ranges rest, I conceive, upon granitic bubbles\* where the plutonic action has been less intense. The fissures and cracks formed by the pressure of these bubbles have been the channels, the gases given off from their surface the immediate agents, of all the alterations. The tracts where only granite now appears swelling above the surface had previously passed through the same stages. In other words laterite is one of the earliest stages in the reduction of the upper rocks superincumbent on a plutonic sea into the substance of which that sea is composed. Where the heat has been least intense, the upper rocks have merely been raised,—where greater, lateritic, scoriaceous, and other partially altered, hill ranges, have been produced. A higher degree of plutonic action has produced quartzo-ferruginous ranges like that of Cape Rachado. The highest degree has transformed or reduced the whole into granite and allied crystalline rocks, from the mode in which the granites, &c. come to the surface at Singapore, we see that the whole region there has been broken up by the plutonic sea below. I can proceed no further however at present, and must close this rough draught of my ideas.

the superincumbent rock as well as upraising and fracturing it. A great fissure would probably be produced when it reached a certain nearness to the surface. As it slowly pressed up it would appear as in (fig. 2), but as it became exposed to the atmosphere, it would have an increased tendency to solidify at the surface, and as it rose above the level of *ad*, (fig. 3), it might already have a semi-solid shell sufficient to prevent the already thickening mass within from swelling out laterally over the surfaces *ab*, *cd*; but suppose it was sufficiently viscid to do so, the consequence would be that the spaces *oo* (fig. 4), would be exposed to an intense heat on two sides and be reduced in a more or less crystalline form to a portion of the bubble. I believe that granitic bubbles always swell up with exceeding slowness, and that the centre of the bubble (if its base be of great size) may remain for centuries, or even longer, in a viscid state, while a thick solid crust of granite has formed on the sides and summit, and that the central part will still exert as slow upward and outward pressure as it solidifies, and may itself be subject to a long continued elevatory pressure from the sea below. In other words the summits of granitic mountains and minor masses may go on rising above the base, after the latter with the whole surface has solidified, and when the base has no further upraised movement save what it may possess in common with the plutonic sea below. Great dislocations in the upper crust must necessarily result, but does not every plutonic mountain range bear witness to such dislocations? I must refer to my paper on Pulo Ubin for the facts on which these veins are based.

\* I do not mean that each base or hill range has a corresponding protuberance on the surface of the plutonic base, but that the whole system of hills and hillocks has been produced by inequalities in that surface and by the directions which the principal and divergent lines of fracture have taken.

*On Various Genera of the Ruminants, by B. II. HODGSON, Esq.,  
Dorjeeling.*

That there are more false facts than false theories in science is the profound remark of an eminent philosopher, and a remark which it is peculiarly incumbent on the real student of Nature heedfully to bear in mind in relation to Mammals, because genuine wild specimens exhibiting the mature and characteristic marks of their species are to be had but rarely and accidentally (owing to the progress of cultivation in all but utterly savage lands); whence has resulted almost necessarily a host of descriptions which, being drawn from very imperfect materials, are inadequate to fix the species, and a host of generalizations which, being deduced from such descriptions, are, of course, imperfect as generic designations.

Such imperfect descriptions of species, and consequent defective (by omission and error) designations of them when thrown into classes or groups, are to be found in works of the highest authority; and, though the causes of these short comings are obvious and not wholly matter\* of reproach to our eminent guides in Zoology, yet is it very desirable now and then to caution the *ordinary observer* against them, lest implicit reliance upon high authority should cause his attention to slumber or somnambulize when it is of the utmost importance that that attention should be wide awake and directed towards all the points to be observed; for, the phenomena being as *scattered* as they are numerous, and capable of being adequately noted only at *the time* and *place* of their *rare and lucky* occurrence, it is the one thing needful to the sound progress of the science whose business is with such phenomena (the structures and the habits of wild animals) that alert observers should exist *every where*, in order that the rare occasions of observation be not lost.

\* Not so in so far as the phenomena are casual, rare, and eminently dependant on time and place and lucky accident for means of adequate observation—but really so in so far as these persons have taken no measures whatever to enable those whose positions are favourable to the observation of such phenomena to make the right use of their unique opportunities. This is the opprobrium of Zoological Societies, and a most grave one it is, though one from which many of the most eminent writers on Zoology are free, as having nothing to do with Societies.



I am fully of Cuvier's opinion that we are now 100 years too soon for the possible tracing of the filum areadneum of Nature, and consequently that the dry skin and inference system of the closet—which ambitiously seeks to work out an impossible problem by means the most inadequate and unfit, instead of supplying guidance to the only persons who are in a position to complete the necessary preliminary observations of the phenomena thus prematurely sought to be generalized—is a mistake and a grievous one. But, though I hold that all present attempts at a general *Systema Naturæ* are folly, and that the true business of the master of Library and Museum in the present infantine state of the science is, to quicken and guide the observing powers of the field naturalist and to thus multiply infinitely the chances of effective observation of phenomena which are necessarily as scattered in the place, as uncertain in the time of their occurrence, yet have I no intention to underrate the value of subordinate Zoological aggregations or classings of animals into minor groups or genera, in the light of *helps to memory and guides to observation*.\* On the contrary, I am most fully aware of the importance of all such classifications in this light, and especially with reference to the material end of quickening and directing *ordinary observation*; and what I regret is that no pains are bestowed in the proper quarter to draw up and disseminate any such directions. Let such a 'how to observe' be framed for each country where observation is still needful; let it exhibit side by side the popular and scientific names of the chief groups of animals in such country; and let each group have appended to it a distinct enumeration of the actual or supposed essential characters of such group, in other words, of the points that ought to be observed in regard to each group, whether for verification or augmentation; and in ten years Zoology will make more real progress than under the continuance of the present system it can do in a century!

The characters of the several groups of animals proper to any given country are now only to be had piecemeal in numerous costly works wherein hardly any one has time or means to seek them; and they exist there, moreover, overlaid with a deal of the leather and prunella of cumbersome useless lore. Let the characters of groups be brought

\* Such guides will always tend more and more towards the natural system, and the best will still be those which least conflict with it.



together in a cheap form, and stript of their buckram, and numberless men of sense and education will be found ready to apply them to their *only true use* in the examination of such wild animals as chance may throw into their way, though such men may be slow, as heretofore, to toil blindly for the convenience of others who ought to, but do not, seek to give interest and effect to their independent researches. Such a guide to ordinary observation is the one thing needful in order to interest men of sense in the matter. Let the means and ends, the structure and the habit, the organ and its use, be thus juxtaposed, and intelligent curiosity will soon be generally turned towards this wonderful system of adaptations, emanating from omniscience. Nor does it materially signify that all the indications of a genus or group of animals be accurate. Only let all of them be set down, some in the shape of queries, and observation under favourable circumstances, that is of the fresh and perfect animal, not of its mere skin, will soon determine the fitness or reality of all such negative or positive marks of a group of animals as are supposed to belong to it. Structures and manners are the two heads under which the directions I advert to should fall. Let the 'what to observe' upon each of these two points be separately set down and applied to the several distinct lots or assortments of animals proper to the country, and there will be forthwith a general and unlooked for effort to fill up the Zoological desiderata! I pretend not in the present paper fully to exemplify my own precepts as above given; nor have I the appliances requisite to the performance of the entire work suggested. That work must emanate from the public Museum and Library, and ought long since to have emanated from them, as their appropriate and best (infinitely best) fruit and repayment of the general contribution. For, where the phenomena to be ascertained are those of rare and secluded animals, where the real objects of study are *vital* organs and their uses, let me ask any man of sense if there be any limit to the superiority of a system which should qualify the only persons in situations to note such phenomena over the system which practically leaves such a work wholly to half a dozen men shut up in cities, though they are obliged to perform it by means so inadequate as skins, eked out now and then by bones? This is a question well worthy of the consideration of Zoological Societies. My present purpose is to add my mite in the way of popularizing and

completing the indication of genera among the Deer, Antelopes, Goats and Sheep, grounding upon H. Smith and W. Ogilby, whose researches into the essential structure of these groups of animals may be seen in the Règne Animal, English edition of Griffith, Vols. IV. and V. and in the Zoological Journal for December 1836, and Penny Magazine, article Antelope: to which add Mr. Gray on the Musk family, Zoological Journal for June 1836. Referring, then, the critical reader to the characters of groups as furnished by these writings, I proceed to exhibit the following amended and additional indications, as the results of several years' observation of nature, and as what I believe will, even if occasionally found inaccurate, tend to quicken and guide the observation of my brethren of the services who are scattered over those wildernesses of this vast land wherein only (or in the vicinity of which) its wild animals can be looked for, or adequately examined, (for they will not keep or carry), and who may be disposed to use their *unique opportunities* for the advancement of a knowledge of God's works, the meanest of which is a miracle of contrivance. We pause over a Watt's steam-engine, how much more should we pause over self-acting machines which support life and wed matter and spirit!

### CERVIDÆ.

#### Mrigádi. Haranádi.\*

Hoofs cloven. Postal plane of scull forming an obtuse angle with frontal plane. Horns solid, falling annually, proper to males only, (save Rein Deer) inserted, superiorly and proximately, below the frontal crest. Front teeth in the lower jaw 8. None above; Canines normal and constant, found in both sexes, or in the males only. Molars  $\frac{6}{6}$ . Mufle normal and constant (save only in Rein Deer and Elk). Teats 4, normally and constantly. Eye-pits constant. Groin pits vaguely defined or wanting. Feet-pits usually present, in all 4 feet, or only in the *hind*.

1. Genus CERVUS. Stags.  
Mriga. Harau.

Horns in males only, much branched, 2 basal, one central, and several terminal, snags.

\* The Sanscrit postfix adi, meaning et cætera, is the probable etymon, and certain equivalent of the Latin idæ and inæ.

Muffle\* large, covering the front of upper lip.  
 Eye-pits moderate and moderately mobile. S-shaped.  
 Feet-pits large in all 4 ? feet.  
 Groin-pits none.  
 Calcic gland and tuft posterior and external.  
 Teats four.  
 Canines in males only.

Types, *Cervus elaphus* of Europe. 2, *Cervus affinis* of Saul forest or Múl Bárah Sinha, and 3, *Giána* or *Cervus wallichii* of Tibet. These animals are further characterised by a very short tail, a large disc or pale space round the tail, and no proper mane. The Indian ones are confined to vast primitive forests on the plain. I have no notes of their intestines, or breeding.

2. GENUS RUCERVUS.  
 Baraiya or Bárah Sinha.

Horns in males only, with one basal snag and no central one, but their summits many-branched as in the true Stags or *Elaphus*.

Muffle large, covering front of upper lip.  
 Eye-pits moderate, mobile moderately.  
 Feet-pits ?  
 Groin-pits none.  
 Calcic gland and tuft ?  
 Teats four.  
 Canines in males only.

Type, *Cervus elaphoides vel du vaueelli*.

This is the Baraiya or Bárah Sinha. It inhabits reedy marshes and islands of great rivers along the whole Eastern and Northern skirt of Bengal and Hindosthan. Never enters the mountains or forests. Herds enormous in the Islands of the Brahmaputra. These animals are further distinguished, like the true stags, by the absence of the heavy mane of the *Rusas*, and by a short tail which however has no true caudal disc and is longer than in the Stags proper ?

3. GENUS PROCERVUS.  
 Gopr or Gower and Ghós.

Horns in males only, small, smooth, greatly divergent, and much bent in the beam, like *Bos*, and furnished with only one ? snag which is basal and forward. Another subterminal ?

\* See N. B. at end for explanation of all these organs.

Eye-pits medial, vertical.  
 Feet-pits none.  
 Groin-pits none.  
 No calcic tuft nor gland?  
 Teats four.  
 Tushes in males only?  
 Type *Cervus dimorphé*. The Gou or Ghós.  
 Habitat Saul forest.

Further subordinate marks of this genus are—

Tail short. No caudal disc. A mane.

The Gowers are not gregarious. They are confined to the Saul forest so far as appears. With their rutting season and gestation I am unacquainted. Intestines 56 feet. Small 29, great 27. Cæcum 19 inches by 4. Diameter of small gut  $\frac{3}{4}$  inch. Liver 3-lobed and a lobulus. Lungs 4-lobed. Gall-bladder.

4. Genus *Rusa*.

Sámber, Jarai (vulgo Jerrow).

Horns in males only, trifurcate: 1 basal and 1 subterminal snag. No central one.

Muffle large, covering the front of upper lip.  
 Eye-pits very large and completely reversile.  
 Feet-pits large in all 4 feet.  
 Groin-pits none.  
 Calcic gland and tuft, posterior and external.  
 Teats four.  
 Canines in both sexes.

Type, *Hippelaphus* or the Sámber, and *Aristolclis* or the Jarai: both continental species of India.

Also, in the Islands, *Equinus*, *Peronii*, *Etam*, and *Mariannus*: but they want testing, all of them.

Habitat, all the great forests of India and of its islands, and to a certain extent, the mountains above them, where the other large Deer are never seen.

These animals are not gregarious: they have a long bluff tail like that of a doeked horse; no disc round it; but a heavy mane over the whole neck.

One anomalous species thence called *Heterocerus* has no upper snag to its horns.\* The *Rusas* rut in spring and then drop their horns.

\* Another large Deer of the Indo-chinese ranges of Hills is *Pandolia Eedii*, the *Cervus Frontalis* of Mr. McClelland. Not found West of the Brahmaputra.

Their females gestate 8 months and produce young in winter, occasionally so early as the end of October, and one at a birth. In confinement the horns are usually dropt in April and take six months for their perfect replacement. The horns are not complete in form till the 4th year nor in size till the 8th year. Small gut 52 feet. Large 31. Cœcum 15 inches by  $4\frac{1}{4}$ .

5. Genus *Axis*.

Chittal. Chittra-chittri.

Horns in males only, with one basal and one subterminal snag, as in *Rusa*, but the beam more bent and the horns paler and smother, and closer grained in structure.

Muffle large, covering front of upper lip.

Eye-pits large, very mobile.

Feet-pits large, in hind feet only.

Groin gland large; sinus vague.

Calcic gland and tuft, postcal and external.

Teats four.

Canines in males only.

Types, 1, *Axis major vel maculata vel nudipalpebra*, or common spotted Deer or Chittal. 2, *Axis; medius* or lesser spotted Deer or Jhow Laghuna. 3, *Axis porcinus vel niger*, or Hog Deer, or Pára, or Khar Laghuna, or Sógoria.

Habitat, general over the plains of India, whence the progress of cultivation has long since driven the larger Deer or Bárah Sinhas and Rusas and Gowers (recte Gorr). These animals have a smooth, generally spotted, coat, no mane, and a long tail reaching to the hock and ending in a point. It is singular that H. Smith should question their having eye-pits and canine teeth.

The Spotted Deer are gregarious, the herds being often very large: the Hog Deer are less so, dwelling more in families. Their breeding season is May, June: their rutting season, December, January. They gestate 6 months. Intestines of lesser spotted species  $65\frac{1}{2}$  feet, whereof the small are 40 and the great  $25\frac{1}{2}$ . Cœcum  $9\frac{1}{2}$  inches by  $3\frac{1}{4}$ , and 5 inches of gut below it, of same calibre; rest equal and narrow. Intestines of Hog Deer  $41\frac{1}{2}$  feet, whereof the lesser are  $24\frac{1}{2}$  and the larger  $16\frac{3}{4}$ . Cœcum  $8\frac{1}{2}$  inches by  $2\frac{3}{4}$ . They rut and breed like the spotted species.

6. Genus *STYLOCERUS* or Stilthorn or Muntjac.  
Dária-Mriga. Ratwa, Káker.

Horns in males only, small, raised on high hairy pedicles, and having only one snag which is basal.

Females with bristley tufts ending in knobs instead of horns.  
Eye-pits very large and extremely mobile.

Facial creases, large, mobile, glandular, placed along inner side of horn pedicles towards their very forward salient bases.

Feet-pits large, in hind feet only.

No groin-pits.

Mammæ four.

Canines in males only? large, trenchant, and exerted, as in the Musks.

No calcic gland nor tuft.

Types 1 sp. Vaginalis or the Kijang of Indian Islands.

2 sp. Ratwa or the Káker of Indian Continent.

Habitat, general in Indian mountains and in forests at their bases. Never elsewhere. Seldom seen above 7000 feet in the Sub-Himalayas.

The Muntjacs are not gregarious though 6 or 8 are occasionally found together. They prefer the dells to the tops, and the close to the open cover. Copse or brushwood of the Chinese bambú is a favourite retreat. They bark all the year but particularly in winter when the males are wanton. January, February is the common rutting, and June, July the common breeding season: the gestation being of 6 months; but they breed occasionally at any season though only once a year, and have one or two young at a birth.

The male's horns fall in May and are perfect again in August. Intestines: male 61 feet; whereof the small are 44 and large 17 feet. Cæcum 15 inches by  $2\frac{1}{4}$ , and 9 inches of gut below it of same size. Rest,  $\frac{1}{2}$  to  $\frac{3}{4}$  inch wide. Intestines; female, 49 feet; whereof small 34 feet and great 15. Cæcum 12 inches by 2, 12 inches of gut below it of like diameter.

## MOSCHIDÆ. THE MUSKS.

Kasturádi. Múshkádi.\*

Feet cloven: no horns: front teeth 8 below, none above. Molar

\* See note in p. 688.



teeth  $\frac{6}{6}:\frac{6}{6}$ . Canines large. Cranium Cervine with the two planes gradually blended.

7. Genus *Moschus*. Kastura, Múskhi-Haran.  
 Muffle large, as in Deer.  
 No eye-pits.  
 No feet-pits.  
 Large caudal gland with lateral pores.  
 No inguinal pits.  
 Calcic tuft and gland external and postcal.  
 Large preputial gland and sac secreting the substance called musk, proper to males only.  
 Teats four.  
 False hoofs very large, acute, and touching the ground.  
 Canines in both sexes: of males, large and exerted; of females, small.

Types, 1, *Moschiferus*. 2, *Chrysogaster*. 3, *Leucogaster*.

Inhabit the great snowy mountain barriers of high Asia from the Himalaya to the Altai, and from the Beluttag to the Peling and Gajar. The Musks are confined to the snowy region amid the glassy precipices of which they leap with a power and security far more than Caprine, though owing to the unequal length of their legs they can descend slopes only with difficulty and falling are caught. They cannot climb at all, as Goats do, and are solitary. They rut in winter and produce young in summer (May-June), gestating 160 days. In 6 weeks the young can shift for themselves and the mother drives them off. They can procreate ere they are a year old, and live 10 to 15 years. One usually is produced at a birth in the cavities of the rocks. Intestines 33 to 36 feet, whereof the small are 23 to 24, and the great 10 to 12 feet. Cæcum simple, 8 to 9 inches by 1; mean diameter of gut 1 inch. Gall bladder\* constant. (See Journal, Nos. 87 and 118, and Gleanings, No. 34.)

8. Genus *MEMINNA*. Pisora, Pisé.  
 Muffle large.  
 No eye-pits.  
 No feet-pits.  
 No groin-pits.  
 Calcic gland nude and external.

\* Prof. Owen doubts this. I have tested it a dozen of times since Dr. Campbell and I made the first examination in Nepaul.

No preputial bag.

Four teats.

False hoofs, ordinary, small.

Canines not exerted, and confined to males?

Type, *Meminna Indica*. Pisora and Pisai.

Inhabits the forests of India in all parts, near to, but without the various ranges of Hills.

### CAVICORNIE MINORES.

Lesser hollow-horned Ruminants or Flocks.

Hoofs cloven. Occipital plane of skull forming a small or large angle with frontal plane. Horns hollow, sheathed, persistent, with thin and dense, or thick and porous cores. Mufle small, for the most part, or wanting. Front teeth 8 below. None above. Canines present or absent. Molars  $\frac{6}{6}$  or  $\frac{5}{5}$ . Teats 4 or 2. Eye, feet, and groin, pits, present or absent.

### ANTELOPIDÆ.

Antelope kind.

Sâsinádi.

Occipital plane of skull forming an obtuse angle with the frontal plane. Core of the horns thin, consisting of dense bone often with a clear sinus at the base within. Horns seated on the superior surface, below the crest of the frontals, and apart at bases. Canines frequent. Mufle present or absent. Teats normally 4 or 2. Feet-pits in all 4 feet or only in the hind ones.

Eye-pits present or absent. Groin-pits present or absent.

N. B. These animals have also occasionally maxillary, intermaxillary and post-orbital sinuses, the number and high development of these organs being one decided characteristic of the Family.

9. Genus *TETRACERUS*.

*Chousinhia*. Chouka.

Horns in males only, four in number. Two inter-orbital; and two behind eyes, but below crest of forehead.

Mufle large, as in Deer.

Eye-pits medial, linear, longitudinal.

Feet-pits in hind limbs only, or none.

No inguinal pits.

No calcic tuft or gland.

Teats four? two?

Canines in the males.

Types, 1, Chikara. 2, Quadricornis. 3, Subquadricornutus. 4, Iodes. 5, Paecerois. (See Caleutta Journal Natural History for May, 1847.)

Inhabit the forests of India generally. Avoid mountains and open plains. Not gregarious. Rutting season, summer. Breeding season, winter. Gestate 6 months, most young born in January, February. They are very shy, and when hunted lie close or go off far ahead, bounding like the common antelope, and hence one of their names, from Chouk, a leap.

10. Genus ANTELOPE.

Antelopes Proper.

Sásin.

Horns in males only.

No muffle.

Eye-pits, medial, very mobile, linear, vertically oblique.

Feet-pits large in all 4 feet.

Inguinal pits large and clearly defined.

Calcic tufts?

Mammæ two.

Type, Cervicapra. Black Antelope. Báránt and Sásin. Very gregarious on the open dry plains of India generally. I have no notes of their intestines or of the breeding.

11. Genus GAZELLA.

Ghazal.

Horns in both sexes.

No muffle.

Eye-pits distinct, mobile.

Feet-pits very large in all 4 extremities.

Inguinal pits large and distinct.

Calcic tufts?

Mammæ two.

Type Doreas. Foreign to India.

12. Genus TRAGOPS. (*τραγος* et *ωψ*)

Chikara, Kálsipi.

Horns in both sexes.

No muffle.

No eye-pits.

Feet-pits large in all 4 feet.

Inguinal pits distinct.

Calcic tufts postæal.

Mammæ two.

Type, Antelope beunnetti vel christii, found generally amid ravines of dry plains of India, and called Chikara and Kalsipi by natives; Ravine Deer by Europeans. Not gregarious.

These animals have the lyrate horns common to both sexes, the knee tufts, lines along the flanks and ovine hairy nose of the Gazelles: but they are wholly void of eye-pits. The dark lustre of their large\* eyes is as striking as in the 2 last groups. Gazelles differ from Antelopes in that their horns are lyrate, and that the females also carry them. The Tragops differ from both by the total absence of sub-orbital sinuses, or eye-pits.

13. GENUS *PANTHOLOPE*.

Chirú.

Molar teeth  $\frac{5}{5}$ .

Horns in males only.

No muffle.

No eye-pits.

Feet-pits large in all 4 feet.

Inguinal saes, purse-like, large, pendent.

Calcic tufts?

Mammæ, two.

Large intermaxillary saes like double nostrils.

Type, *Antelope hodgsonii*, Abel. The Chirú.

Habitat open plains of Tibet. Gregarious, rutting season, winter. Breeding season, the summer. Gestate 6 months. One young at a birth. They are very pugnacious and jealous, and in their contests often break off their long horns one of them. Hence the rumour of Unicorns in Tibet. (See Gleanings and Journal Asiatic Society, Nos. 2 and 27.)

14. GENUS *PROCAPRA*.

Goa and Ragoo.

Horns in males only.

No muffle.

No eye-pits.

Feet-pits small in all 4 feet.

Post cornual sinus, large.

No inguinal pores.

Calcic tufts postcal.

Mammæ two.

Type *P. picticandata*. Goa of Tibet.

\* This is one of the marks by which the Antelopine family may be distinguished from the small pale-eyed Goats or Caprine family.

Inhabits ravines on the open plains of Tibet in small herds or families. See Journal Asiatic Society, No. 173.

15. Genus *KEMAS*.

Goral.

Horns in both sexes.

Muffle medial.

No eye-pits.

Feet-pits medial in all 4 feet.

No groin-pits.

Calcic tufts ?

Mammæ four.

Type, Antelope Goral. The Goral. Habitat the Sub-Himalayas as far towards the snows as the great forests extend, to which exclusively these animals adhere. Dwell in families 4—6 together. Breed amid crags and rocky recesses. Young mostly born in May, June : gestate 6 months. Rutting season January, February. Produce one young at a birth.

16. Genus *NEMORHEDUS*.

Vel *Capricornis*.\*

Thár or Saraw.

Horns in both sexes.

Muffle medial.

Eye-pits round and furnished with a very large gland.

Feet-pits extremely large in all 4 feet.

Groin pits none.

Calcic tufts none, nor gland.

Mammæ four.

Type, Antelope thár. The Thár or Saraw.

Habitat the Sub-Himalayas as far north as the great forests extend.

Also, Antelope *Sumatrensis* of the Islands of India.

The Gorals and Thárs have the round black and ringed horns of Antelopes, which otherwise they little resemble, being stout clambering mountain animals, but not, as supposed, affined to the Bovines. The Gorals differ from the Thárs by wanting the very glandulous eye-pits of the latter, and both are sundered from the *Hemitrages* by their large

\* *Sumatrensis* is Col. Smith's type, and Mr. Ogilby says this is identical in structure with the Thar, Mr. O.'s. type of *Capricornis*. If so, Col. Smith's generic name will have the priority ; if not, it will be the type of *Nemorhedus* and the Thar of *Capricornis*. Col. Smith's several species of *Nemorhedus* are as heterogeneous as Mr. Ogilby's of *Kemas*.

feet-pits, Antelopine horns, and absence of Caprine odour. The Thárs are not gregarious at all. They rush with fearful precipitancy down the steep mountains they inhabit. Rutting season, February, March. Young (one) born in September, October. Gestate 8 months. Small gut 65 feet. Great 32 feet. Cæcum 15 inches long by 3 wide, and simple. Gall-bladder constant. (See Journal No. 45 for Sept. 1835.)

## CAPRIDÆ.

Goats and sheep.

Bakarádi.

Occipital plane of skull forming an acute angle with frontal plane. Cores of horns thick, porous and cellular. Horns seated superiorly on the crest of the forehead and by their union covering the top of the head. Canines wanting. Teats normally but two, rarely 4. Mufle abnormal and almost invariably absent. Feet-pits in all four feet or only in the fore-feet, or none. Eye and groin pits present or absent.

## 17. Genus HEMITRAGUS.

Jhárál vel Tehr.

A small mufle.

No eye-pits.

No feet-pits.

No inguinal pores.

Calcic tufts?

Four teats.

Strong caprine odour in males.

Types. 1, *Capra Jemlaica*. 2, *Capra Jharál vel Quadrirammiss*. 3, *Capra Waryatu*, whose female is *Hylœcrius*. Habitat the loftiest mountains of India: the Sub-Himalayas near the snows and the highest part of the Nilgiris. A very remarkable type tending to connect the keeled, compressed, hollow-horned and odorous Goats with the Deer family which want these marks, but possess the mufle and 4 teats of the Hemitragæ, marks which the true Goats (and Sheep) are void of.

The Jharál's retreats are among the most inaccessible bare crags of the Hemáchal, close to the perpetual snows, beyond the forests. They feed in the open glades below such crags, at early morning and evening, retiring in the day to their awful fastnesses. They are gregarious and the flocks often amount to 40 or 50 animals, but generally do not exceed 20 or 30. If alarmed when feeding they go off at speed with a noise like thunder, but anon halt to gaze on the intruder, whose shot sends



them off again under the guidance of an old male whom they all follow blindly. The rutting season is the winter. The females gestate 6 months and produce usually but one young, in the months of June, July. The habitat and manners of the wild sheep are very similar to those of the Jharáls, only the latter are still more dauntless and skilful climbers. If they can but touch a rough edge or crevice now and then, they will run up nearly perpendicular precipices of many feet elevation; and they will stand on a bit of rock not larger than one's palm, looking confidently down over sheer space, with not a shrub to break the awful absence of rest for the foot. In February 1842, a male Jharál in possession of the Court of Nepaul had intercourse with a female Axis, which in July produced a young hybrid of mixed appearance, but more like the mother than the father, and which lived and grew up a fine animal. I saw it last in October 1843. I note the circumstance as a strong corroboration of that affinity of the Hemitragas to the Deer (not Bovines, as Mr. Ogilby supposed) which is indicated by the 4 teats and moist muzzle of the former, notwithstanding that the Hemitragas in all other parts of their structure, as well as in their rank odour and in their manners are such perfect goats. From the true goats however they differ, besides the grand points noted, by the total absence of beard and of feet pores. Nor could I ever get any progeny from the goats by the Jharál,\* though my male of the latter species had commerce with Goats of several breeds, repeatedly, during the 6 years he lived with me, quite tame and going abroad with the sheep and goats. Small intestines 53 feet. Large, 25=78 feet. Cæcum 1 foot long and  $2\frac{1}{4}$  inches wide. Small gut  $\frac{3}{4}$  inch in diameter; great gut  $2\frac{1}{2}$ . Cæcum simple, that is, not banded nor sacked.

18. Genus CAPRA.

Bakra Goats.

Horns in both sexes.

No muffle.

Feet-pits in the forefeet only or none.

No inguinal pores.

Mammæ two.

Odour intense in males.

Caleic tufts none.

\* They copulated freely and I was told would breed. Hence the erroneous statement in the Journal for Sept. 1835, disproved by experiments.

Type, *Capra ægagrus*. Habitat Persia. Foreign to India, and not therefore subject to my examination: but the several tame races of Tibet and the sub-Himalayas (Chandra, Chyapu, Sinál) and also the common Goats of the plains (Dûgû and Jamnaparia) are *all* typical. These animals are further distinguished by horns inserted very obliquely, not angular, compressed, and presenting a sharp keeled edge to the front, whereby they may be distinguished at once from all kinds of sheep and also from the Ibexes. They have likewise invariably a true beard common to both sexes, as have also the Ibexes; but the sheep never: and, lastly the Goats have callosities on the chest and knees or knees only. Eminently bold, saucy and scandent. Gregarious. Rut in winter. Procreate in summer. Gestate under 5 months? Produce 3, 2, or 1 young at a birth. (See paper on tame Goats and Sheep of these regions, Sp. Mag. for June, 1847.)

19. Genus IBEX.  
 Skin. Kin.  
 Horns in both sexes.  
 No muffle.  
 No eye-pits?  
 Feet-pits none?  
 No inguinal pores?  
 Mammæ two.  
 Odour in Males?  
 Caleie tufts?

Types. Europea. Caucasia. Jacla. Sakin. Sibirica.

Habitat the loftiest mountains of Europe, Asia and Africa. Found in the Himalaya close to the snows. These animals, with the general manners, the odour and the beards of Goats, are distinguished invariably by angular horns presenting a distinct surface, instead of a mere edge, to the front, thereby differing from the Goats proper and approximating to the Sheep. The front of the horns is likewise remarkably nodose, and the horns are of great size and sickle-like curve. Their structural peculiarities want testing and will doubtless show deviation from the type of *Ægagrus*. Rut in autumn. Breed in spring. Gestate  $5\frac{1}{2}$  months. Produce 2 or 1 kids. Gregarious, bold, and scandent.

20. Genus OVIS.  
 Bhéra. Sheep.

Horns in both sexes.

No muffle.

Eye-pits large but immobile.

Feet-pits small but present in all four extremities.

Inguinal glands distinct. Pores vaguely defined.

Calcic tufts and glands none.

Mammæ two.

No odour in males.

Types, *Ovis Ammon* or the Argali of Siberia, and *Ovis Ammonoides* or the Argali of Tibet.

Habitat the snowy barriers of high Asia, Ammon being confined to the remoter, and Ammonoides to the nearer ranges. These animals are further distinguished as a group by angular, compressed, heavily wrinkled horns turned almost into a perfect circle, and their flat points directed forwards and outwards; by very short diseed tails; and by the absence of beard. The wild Sheep proper, or Nyens of the Tibetans, never mix with the Nahoor. They are far more hardy, active and independent than any tame breeds of their kind, as may well be supposed from their terrific abode amid the snowy peaks of Hema-chal. They are gregarious, feed in the glens, seek refuge on the tops, and leap and run with Deer-like power, though as climbers inferior to the Hemitragas, and as leapers to the Musks. They are often snowed up for days without perishing, unless their breathing holes should betray them to man, a more terrible foe, than the direst inclemency of the seasons! They rut in winter, breed in early summer and gestate it is said, 6 months, probably not above 160 days. The Nyens or Ban Bheras (that is, wild sheep) seldom or never cross the Hema-chal, the Indian side of which range is the special habitat of the Nahoor, while to the North and West beyond Tibet, our animals are replaced by other species; so that Tibet may be considered as the special habitat of one species and the plateaux North of Tibet as far as the Altai, as that of the other species, above cited as types of the true ovine form; and it may here be added that the six sorts of tame sheep of Tibet and the Sub-Himalayas, all, without exception, exhibit the essential characters of that form.

21. Genus *PSEUDOIS*.  
 Nahoor.  
 Horns in both sexes.  
 No muffle.  
 No eye-pits.  
 Feet-pits small in all four feet.  
 Inguinal glands distinct. Pores vague.  
 Calcic tufts none.  
 Mammæ two.  
 No odour in males.

Types, *Ovis Nahoor* and *Ovis Barhel*.

Habitat the Himalayas.

These animals are contradistinguished, besides the want of eye-pits, by rounded uncompressed smooth horns directed upwards and backwards with great divergency, and their round points again bent inwards; by short deer-like tails, but longer than in the last and undiseed; and, lastly, by the absence of any thing like mane or beard. The Nahoors rut in winter, breed in summer and gestate  $5\frac{1}{3}$  months. Their manners, so far as known, resemble those of the Nyens: but the two never commingle nor approach each other, nor will the males, how long and completely soever they be tamed have sexual commerce with domestic sheep. Great gut 24 feet. Small gut 50 feet. Cæcum 17 inches, by  $2\frac{1}{2}$  wide. Large gut near it, of same diameter. Liver 2 lobed, each subdivided and a labulus. Ribs 13 pairs.

22. Genus *CAPROVIS*.  
 Moufflons.  
 Horns in the males only.  
 No muffle.  
 Eye-pits small but distinct.  
 No interdigital pits.  
 Inguinal gland? pore?  
 No calcic tuft?  
 Mammæ two.  
 No caprine odour.†

Further distinguished by horns bent into a half circle over the back,

\* *ψευδος* et *ŏis*, see Journal, No. 173.

† This is the only form not verified by myself that I have meddled with, and I am indebted to the Prince of Canino for its characters.

heavily wrinkled, angular and compressed, by deer-like tails, no beard nor mane nor caudal disc.

Type, *Ovis Musimon*. The Mouflon. Habitat Corsica, Sardinia.

N. B. The 'Mufle' is the naked moist skin round the end of the upper lip and nostrils, seen in perfection in the Ox. The 'eye-pits' are slits or punctures on the cheek, just below the eye. They are round or linear and elongate: and, if the latter, are curved or straight and can be turned almost inside out, or are partially or wholly immobilo. The 'feet-pits' are punctures in front of the pastern, in the cleft between the two bones. The 'groin-pits' are fissures in the groin more or less definite in outline, and furnished with glands which secrete a fragrant viscid substance very like the secretion of the other sinuses.

The 'calcic glands' are placed on the stifle, inside and outside, or only the one, and are often naked and tumid externally. There is a whorl or callous nude spot in many quadrupeds at its side.

The 'tail-gland' of the Musks is very large and covers the whole tail nearly, and has a linear longitudinal pore on each side, and an abundant secretion.

The 'preputial gland' of the Musks is analogous to that of the civets and serewtails (*Paradoxurus*, vulgo Málwa.) It is placed on the prepuce, the penis opening in the midst of it. This organ is clearly subservient to sexual purposes, and so probably are several of the others, though the eye-pits have been variously referred to the facilitation of breathing and of smelling. The supposed end of the interdigital gland and pore or feet-pits, viz., the lubrication of the foot and preservation of the hoof in hot sandy deserts, is clearly erroneous, since the Thár has these organs of enormous size in all 4 extremities, though it be the tenant of moist cool mountain forests. It is probable that the secretion from the foot pores enables these animals to find one another in those wildernesses of vast forest trees and dense undergrowth which constitute their range.

The shape of the orifice and of the gland, and the nature of the secretion from the latter, as well as the periodical augmentation thereof, should be closely attended to—and that *generally*, or with reference to *all* these pits or sinuses. The distinctive form of the upper outline of the skull, and character of the core of the horns, in the Antelopidæ or Antelope kind, and in the Capridæ or Goat and Sheep kind, and again

in the Deer kind and Ox kind, the subjoined sketches (See Plate) will best make me understood; and I would suggest particular attention to this point as a key, as well to the mutual affinities, as to the differential characters of all these groups. The Antelopes are thus clearly separated from the Goats and Sheep, and distributed into two groups of their own, one that of the more typical genera which class with the Flocks; the other, that of the abnormal genera, which range with the Herds.—I meddle not with the last named group or Bovine Antelopes (*Busdorcidae*): but in regard to all the others, inclusive of the Musks whose Cervine affinities are thus made palpable, I beg of you to examine well the sketches and to note the signal and abrupt fall of the postcal plane of the skulls in the Caprine and Bovine Families, and its gentle slope in the Cervine and Antelopine Families. The Antelopine skull depicted is that of the Thár, and you may thus satisfy yourself at once that this type (as well as *Kemas* which agrees\* with *Nemorhædus* in this important point) is an Antelopine, not Bovine type. In like manner—that is by attending to the form of the skull and the consequent position of the condyles—you may obtain demonstration of the Caprine affinities of *Hemetragus*; and, in fact, the whole genera of these perplexing families may thus be set in order.

I now proceed to the Bovines or Ox kind.

CAVICORNIE MAJORES, or,  
Bovidæ or Herds. Gaudrisha.

Hoofs cloven. Occipital plane of skull forming a large angle with frontal plane. Horns hollow, persistent, sheathed, with a thick cellular core springing laterally from the apex of the forehead.† Muzzle large. Front teeth, above none. Below 8. Canines none? Molars 6. Teats 4. Dewlap present or wanting.

\* The agreement is not close, so that *Goral* is osculant towards the *Capridæ*. The characters of both were printed by me (*Journal*, Sept. 1835) a year and quarter before *Mr. Ogilby*, (*Dec.* 1836, *Zool. Jour.*)

† These marks of the family may be supposed exclusive to the subfamily: but I apprehend not, and that they will serve usefully to sunder the antelopes allied to *Bos* and those not so allied, or *Antelopidæ* and *Busdorcinae*.





1. 1/2 inch, some 12 inch high.

Capit. la. 3. 411. 12

## FRAGMENT

*of aLintel from the Site of the  
Indo Greek City of Bucephalia  
on the Hydaspes.*



Skulls with horns cut off, to show the outline and nature of the horn cores



I Skull of Cervidae. II of Bovidae. III of Antelopeidae. IV of Capridae



## BOVINÆ OR OX KIND.

## Gauádi.

Occipital plane of the skull forming a large angle with the frontal plane. Core of the horns massive and very porous or cellular. Horns in both sexes, inserted laterally on the apex of the frontal crest. Canines none. Muzzle very large. Teats invariably 4. Dewlap, in most, normally. No eye-pits. No feet-pits. No groin-pits.

1. Genus *Bos*. Oxen.  
Gau.

Cranium moderate, compressed, proportional, or without excess in the cerebral or facial region. Frontals shorter than the face, flat, and not broader than long.

Occipital plane of the skull square, never arched along the ridge line, nor indented by the temporal pits, smaller than the frontal plane and forming an acute angle therewith.

Condyles of great foramen and of lower jaw, elevated greatly, and the jaw much curved.

Horns attached to the highest line of the forehead, rounded, curved up or down or forward ascendantly.

Orbits not salient.

Thirteen pair of ribs.

No true dorsal ridge, but sometimes a fleshy hump.

Muzzle very large and square.

Dewlap great.

Type. *Bos domesticus*. Gau.

2. Genus *GAVEUS*.  
Gavi or Gabi.

Cranium large, having the ample flat forehead as long as the face and broader than long, but not ridged nor curved along its crest.

Occipital plane equal to the frontal plane and moderately indented subcentrally by the temporal fosses, square and forming an acute angle with the frontal plane.

Condyles of great foramen and of lower jaw low, and the jaw little bent.

Orbits not salient.

Horns attached to highest line of forehead, more or less depressed, and angular, and directed upwards and outwards with little curvature.

A true dorsal ridge but confined to the withers.

Mufle moderate.

Dewlap moderate.

Thirteen pairs of ribs.

Type. *Bos frontalis* vel *Gayœus* vel *Sylhetanus*.

The Gavi or Gabi. Habitat trans-Brahmaputram, the forests under the ranges extending from Assam to the sea. The Sénbár vel Phain may probably be a second species, and *Bos Sondaicus* or the Benteng, a 3rd, and the insular species: but these want testing. The first is more than half redeemed from the wild state, like the Yak of Tibet. The others are entirely wild. I possess no memoranda of the soft anatomy or intestines, nor of the breeding season and gestation.

### 3. Genus BIBOS. Gaur, or Gauri Gau.

Cranium large, massive, with the frontal and cerebral portions preponderant over the facial.

Frontals as long as the face, broader than long, concave and surmounted by a salient arched crest.

Occipital plane spheroidal, very large, larger than the frontal plane, deeply indented centrally by the temporal pits, and forming an acute angle with the frontal plane.

Orbits salient.

Condyles of great foramen and of lower jaw low, and the latter straight.

Horns attached below crest of forehead, sub-depressed, sub-angular, and curving ascendantly.

Thirteen pairs of ribs.

Dorsal ridge co-extensive with the ribs, and of great elevation.

Mufle small.

Dewlap small.

Type. *Bos Gaurus* vel? *Cavifrons*. The Gaur or Gauri Gau. Cæsar's wild Bull of Europe and Aristotle's of Persia, are two other species of



Bibos or of Gaveus, which could we test them might be respectively called *Classicus* vel *Cæsar*is et *Aristotelis*. The Gaurs inhabit the primitive forests of India generally, under the great ranges of mountains, such as the sub-Himalayas, the Vindhias, the Satpúrás, the Gháts, Eastern and Western, and their links with the Vindhias, and with the Nilgiris. Beyond the Bruhmaputra Bibos is replaced by the last type, of which there would seem to be two species in the Indo-Chinese countries, one of them extending to Ceylon, if the Lanka wild Ox be not rather a Bibos; I suspect there will prove to be at least two species of Bibos, as of *Rusa*, inhabitants of India between the Cape (Comorin) and the sub-Himalayas, or *B. Gaurus* and *B. Cavifrons*.

For the skeleton of the Gaur, I may refer the reader to the Asiatic Society's Journal, No. 114, and No. 69. Of the intestines I possess no memorandum. The period of gestation was in Nepaul always stated to me to exceed that of the common Ox: but Mr. Elliot will not allow this. The Gours rut in winter and procreate in autumn, producing usually but one young at a birth. The herds are ordinarily rather numerous, 20, 30, 40, and sometimes even double these numbers, being found together, but in the breeding season, not above 10 or 15 cows with a single mature vigorous bull, who jealously expels every young and old male from his Haram. The sub-Himalayan species entirely avoids the open Tarai on the one hand, and the hills on the other, adhering to the most solitary parts of the Saul forest, close to and between the salient spurs of the hills where the periodical firing of the undergrowth of the forest never reaches. In the Deccan these animals are said to penetrate into the hills in the hot weather—very partially, I fancy, or else they must then lack cover on the plain, for they are not a mountain race at all. They feed early and late in the more open glades of the forest, posting sentinels the while and manifesting in their whole demeanour a degree of shyness unparalleled among the Bovines. They never venture, even in the rains, when there is abundance of most rank vegetation to cover their approaches, into the open Tarai to depredate on the crops, as the wild Buffaloes constantly do; nor do they ever associate, or have sexual commerce, with the tame cattle, though immense numbers of the latter every spring are driven into their retreats to feed, and remain there in a half wild condition for three or four months, when the wild Buffaloes fre-

quently have sexual intercourse with the tame ones of their kind, of which likewise vast numbers are depastured there. Old males of the Gaur are often found solitarily wandering the forests they frequent, especially in winter : but these have probably been recently expelled the herds by their more vigorous juniors, and re-unite themselves with some herd after the season of love and contention has passed. It is exceedingly difficult to rear the Gauri Gau in confinement. Nor did I ever know a successful experiment, though the attempt has been, for 50 years past, constantly made by the Court of Nepal, which finds no difficulty in rearing wild Buffaloes and causing them to breed in confinement with the domestic species, which is thus greatly improved in size and other qualities. I have remarked on the excessive shyness of the Gaurs ; and it follows that, when approached, they will retreat so long as they can : but if compelled to stand and defend themselves, they do so with a courage and determination not to be surpassed. Their beef is unequalled for flavour and tenderness : but to the aborigines only it is illicit food, and not to all tribes of them ; nor are any of them allowed to kill the Gaur in Hindu kingdoms. The Gaur stands from 6 to  $6\frac{1}{2}$  feet high at the shoulder, and is either of a ruddy brown, alias tan, or of a black colour, the forehead and limbs below the mid flexures being pale, and the forehead and knees tufted. Capt. Tickell, a good observer, believes that there are two species of Bibos in the Chota Nagpoor territories *alone* ! Doubtless close investigation will reveal many new species in the Bovinæ.

#### 4. Genus BISON.

Yak. Chouri Gau.

Cranium moderate, depressed, with the facial portion exceeding the frontal and cerebral parts.

Frontals broader than long, convex and forming an obtuse angle with the occipital plane.

Occipital plane smaller than the frontal plane, trigonal or semi-circular, and ridged by the parietes.

Orbits salient.

Condyles of great foramen and of lower jaw low, and the jaw straight.

Horns attached below the curved or pent intercornual ridge, rounded and curving out of the horizontal line.

Ribs 14 or 15 pairs.

A true dorsal ridge, confined to the withers.

Mulle small.

Dewlap none.

Types. *Americanus* et *Poephagus*.

The latter is the Yak or Chouri Gau.

It inhabits all the loftiest plateaux of High Asia between the Altai and the Himalaya, the Belut Tag and the Peling mountains, and is found wild as well as tame. It cannot live on this side the Himalayas beyond the immediate vicinity of the snows, where the tribes of the Cachár or Juxta-nivean region of the sub-Himalayas rear large herds and cross-breed with the common Ox. The Yak ruts in winter and produces young in autumn, after the usual period of Bovine gestation. Small intestines 107 feet. Large  $33\frac{1}{2}$  feet. Cæcum  $2\frac{1}{4}$  feet. Width of small gut  $1\frac{1}{2}$  inches; of great, 2 inches; of cæcum 4 inches. Cæcum simple, that is, not saccéd nor banded.

# 5. Genus BUBALUS.

Bhainsa. Arna.

Cranium large, elongate, compressed, exhibiting great excess in the facial over the frontal and cerebral portions.

Frontals short, narrow, convex, forming an obtuse angle with the occipital plane.

Occipital plane larger than the frontal, spheroidal, moderately indented.

Condyles of the foramen and lower jaw low, and the jaw little curved.

Horns attached to highest line of frontals, depressed, angular, and horizontal.

Thirteen pairs of ribs.

No true dorsal ridge nor hump.

Mulle very large and square.

Dewlap medial.

Types. *Bubalus Buffelus*, or the Bhainsa, and *Bubalus Arna* or the Arna.\*

Habitat of the tame, universal; of the wild, also every where where adequate cover and swamp exist. The haunts of the Arna or wild

\* *Bornouensis* and *Brachycerus* are to my mind no Buffaloes, and their united horns form a character at variance not only with the genus but the family. Hence I denominate them from this feature *Syncerus* (*συν et κερος*). They are foreign to India, the land of the true Buffaloes.

Buffaloe are the margins rather than the interior of primeval forests. They never ascend the mountains, and adhere, like Rhinoceroses, to the most swampy sites of the districts they frequent. There is no animal upon which ages of domestication have made so small an impression as upon the Buffaloe, the tame species being still most clearly referrible to the wild ones at present frequenting all the great swampy jungles of India. But in those wildernesses as in the cow-houses, a marked distinction may be observed between the long-horned and curve-horned Buffaloes, or the *Macrocerus* and *Spirocerus* of my Catalogue—which whether they be separate species or merely varieties, I shall not venture to decide, but I incline to regard them as species. The length of the horns of *Macrocerus* is sometimes truly enormous, or  $6\frac{1}{2}$  feet each.

There is such a pair in the British Museum, and another pair I saw in Tirhut. The Arna ruts in autumn and the females produce one or two young in summer after a gestation of 10 months. The herds are usually numerous and sometimes exceedingly so, though at the season of love the most lusty males lead off and appropriate several females with which they form small herds for the time. I have no memorandum of the intestines of the Arna. This noble species is, in the Saul forest and Tarai, a truly stupendous animal, as tall as the Gaur and longer considerably, and of such power and vigour as by his charge frequently to prostrate a well-sized elephant! The wild animals are fully a third larger than the largest tame breed, and measure from snout to vent  $10\frac{1}{2}$  feet, and six to six and half feet high at the shoulder. The wild Buffaloe is remarkable for the uniform shortness of its tail, which extends not lower than the hock; for the tufts which cover his forehead and knees; and, lastly, for the great size of his horns and the uniform high condition of the animal, so unlike the leanness and angularity of the domestic buffaloe's figure, even at its best.

I have now disposed of all the Bovines proper of India, and might next proceed to the Bovine Antelopes or *Busdoreinæ* which form another sub-family of the *Bovidæ*. But those animals, with one exception, and that a doubtful one—viz. *Portax picta* or the Nilgau—are wholly foreign to India, and the Nilgau itself rarely found on the left bank of the Ganges, how common soever across that river all the way to the Deccan and Carnatic. Wherefore, having no personal knowledge of the group, I leave it untouched. It will be seen above that my

principle of generic classification is organic. I assume that *every* organic variation is a sign of genus; that *nothing but* organic variation is a sign of genus; that we are too ignorant at present of the real nature and use of most organs to decide on their relative value and to reject some because they seem comparatively uninfluential on the habits and economy of the animal endowed with them; that the organ is always the datum; its use always the desideratum, and that all organs ought to be prominently set forth until their structures, uses and relative importance be decided on; that all three sorts of teeth are organs, and all therefore are properly introduced to mark genera and even higher groups; that there is *not* that entire uniformity of dentition among the Ruminants which has been so long asserted; and, lastly, that the special form of the horns in the Cervidæ, though not strictly an organic mark, may yet be wisely used at present to help the indication of genera, because it is a very palpable sign, and one besides usually harmonising with, and indicative of other and organic modifications yet partially or wholly understood.\*

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*Notice on the Ferruginous Spherules imbedded in Sandstone from Lul-lutpore, in Bundelcund, by Dr. G. G. SPILSBURY.—By H. PID-DINGTON, Curator Museum Economic Geology.*

We have received from Dr. Spilsbury an additional supply of the curious little Ferruginous Spherules described in my report of September 1846, from their resemblance in miniature to the spherical volcanic Bombs figured by Mr. Darwin as being possibly *volcanic grape-shot*, and since that time I have observed that some being sent to the Agricultural Society, Dr. McClelland thought they might be fossil fruits. I have seen these and find them externally the same as ours, and I have therefore submitted ours to a farther examination, of which the result is—

That they are infusible before the blowpipe; that they are not magnetic, but when exposed to the redning flame of the blowpipe they become so. That when dissected by long immersion in muriatic acid they leave nothing but a residuum of coarse white granular siliceous

\* Mr. Hodgson's correction of an oversight in the description of Genus Axis, page 691, reached us after the sheet had been printed off. For "canines in males only," read "canines in both sexes."—EDS.



a finer one in a gray impalpable powder, which being examined before the blowpipe is silica with oxide of Iron.

There is no trace of any thing like organic arrangement, such as cells, &c. which are rarely completely obliterated in fossil fruits, how complete soever the mineralisation of the substance of the fruit may be.

The strongest proof however to my mind that they are not fossil fruits, but originally ferruginous spherules, whether formed by volcanic action (or by that which produces the pisolitic iron ores?) arises from the matrix in some of the specimens being almost wholly destitute of iron! and the spherule having evidently *given iron to it*, round its place, in which when detached it leaves a coating of peroxide of iron which stains the sandstone. Now if the spherule had been originally a fruit, it must have obtained its iron from the sandstone itself or from filtration through it, which would have stained it, for we know of no colourless solution of iron like those of silex and lime, which may pass through a rock and be deposited in bodies for which they have an affinity without leaving coloured traces of their passage.

One which I fractured contained a nucleus, excentrically situated, of coarse sand, as if it had been inclosed in a globule of molten iron.

This spherule weighed 33 grains and gave by muriatic acid approximately as follows :

Of coarse silica, .....	16	grs.
Fine impalpable powder of silica with some iron, ..	4	
Oxide of Iron, .....	13	
	<hr/>	
	33	

I am therefore still inclined to think these spherules inorganic, and that they have been suddenly deposited in their present position as ferruginous globules, but by what agency we cannot say. The amount of sand in them would almost entitle them to be called ferruginous sandstones.

Mr. Darwin, in his recent work on South America, p. 123, describes some ferruginous volcanic concretions, which are however fusible, as from two inches to two feet in diameter; their insides consisting of a fine scarcely adherent volcanic sand or of an argillaceous tuff. He quotes also D'Aubuisson (to whose work I have not the opportunity of referring) as adverting to the tendency of iron to form hollow concre-



tions or shells containing incoherent matter. Our spherulites are evidently yet a problem for resolution, and it is only by attention to the mineralogical conditions of it that we can hope to see its geological bearings properly estimated.

*Notice of the Deo Monnees,\* or sacred beads of Assam, by the same.*

Major Jenkins sends me in a letter a string of six of these singular objects, of which he says :—

“I shall be obliged if you can tell me what these beads are, and if you know where any similar are to be had, and whether they are artificial or natural? I suppose the latter are jaspers?”

“You may have seen such and blue and white beads made into necklaces by the Faqueers, the blue and these are in very great demand with all our hill tribes, and could I obtain a few strings of sizes they would be very useful to give as occasional presents to chiefs whom we may seek to attach to our government. Why these beads are considered so valuable amongst these tribes I only account for by supposing they are very scarce, could they not be easily imitated?”

And Captain Smith writing to him says :—

“I send you some of the Deo Monnees so prized by the Singphos and without a string of them, a wife is not to be had. I send small ones, as I should have to pay 5 Rs. for a large sized *one*; those similar in grain to the *Ash* wood and irregularly bored are most prized, they should be of both the colors I send; they are valued most because they are supposed to be the real Deo Monnee, and are said to be found ready bored. Those that are particularly smooth outside, and regularly bored are not so valued, as they are thought to be the work of man's hands, whereas the others are by the gods themselves.”

These singular objects of veneration (the small-sized ones as sent to us) are small flat circular disks, about from one to  $1\frac{1}{2}$  eighth of an inch thick and from one to two eighths in diameter, with holes in the middle or towards it. The colors are from a dirty greenish yellow to a bright sealing wax red; some are yellowish and marbled with the red colour in veins like Jaspers, but the red ones are not marbled with yellow. These

\* *Deo Monnee*, Jewel of the gods.

disks appear at first sight like sections of the jasperized stems of gramineous plants, or small pithy wood, and at the edges some of them (the yellow more than the red) appear marked with strice exactly like part of a small petrified twig. When polished however no traces of vessels can be discerned on the transverse section of either the green or red ones by a magnifier.

Selecting one which was a fair medium between the yellow and the red, I submitted it to the following tests. Premising however that its entire weight was not more than  $1\frac{1}{2}$  grain.

*Examination.*

It is excessively brittle, the fracture may be called splintery—conchoidal, as well as one can distinguish in such minute specimens, and it is the most splintery substance I am acquainted with, the slightest touches of the pestle making it fly as if from an explosion, so that it must be powdered in a covered or a steel mortar. The fractured surface is that of a red enamel or bright sealing wax. The powder resembles brick-dust. The hardness is 5-6, or between Apatite and Adularia. It scratches Fluor readily, and does not yield to the knife.

It does not adhere to the tongue or show any effervescence with acids. Its smell, if any thing with such small specimens, is metallic when breathed upon. It is not magnetic.

*Before the blowpipe* in the forceps and on charcoal it fuses immediately to a dark steel-coloured brilliant globule, which below is marbled with broad greyish and dirty white veins. This globule is not magnetic and internally has the red fracture of the fresh *Deo Monnee*.

*With borax on Platina wire* it fuses entirely to a bright emerald green glass while hot, which becomes of a pale blue on cooling.

With the addition of metallic tin this bead gives a brownish red enamel. The colouring matter of the *Deo Monnee* therefore is principally protoxide, and perhaps the suboxide of copper, and, as will be subsequently seen some iron.

*Vid Humidd.*

The powder is not soluble in Muriatic, Sulphuric or Nitric acids. The Sulphuric acid gives it a dull brick or brown-red colour which becomes brighter after several days, the other two acids brighten the powder almost to an orange, though quite colourless.

Boiled in Nitro-Hydrochloric acid a part appeared to dissolve and the vapour had a remarkably disagreeable smell.

The filtered solution gave traces of Iron, and faintly but distinctly of Copper, though not so strong as one would expect from the blowpipe test. The red powder remaining on the filter fused readily with caustic soda in a silver capsule, and when cold was a dirty greenish mass, the whole of which was soluble in Muriatic acid and the solution gave also traces of Iron and Copper.

It was evaporated to dryness and redissolved in pure water, when it left untouched a buff-coloured powder, which by the blowpipe was found to be silica tinged with Iron, the solution gave as before traces of Iron; but was too dilute to show the Copper. I suppose indeed that much of the Copper may have been volatilised, and it is possible that the substance may contain Arsenic.

The above I publish merely as a guide for future investigations when more of the substance can be obtained, such preliminary notes being always of great utility to the working chemist. In reply to Major Jenkins I should say—

That the fusibility and low degree of hardness of the one bead we have experimented upon, while it puts it out of the classes of Jaspers and Pitchstones (of which further we know of none containing copper?) would incline as to believe that it is an enamel, in which the oxides of copper are frequently used as the red colouring matters; and it is not difficult to suppose that the Singphos obtain these, fabricated to imitate Jaspers of these colours, through tribes in intercourse with the Chinese of Yunan. The talent of the Chinese in enamel work of all kinds we well know, and no doubt the beads might be imitated by any person who understood enamelling.

The only natural mineral beads I can find in the bazar are red and white cornelians. Some of blue glass have, I observe, strice on the unground facets so that the circumstance of our *Deo Monnees* having them does not count as an evidence of their being natural productions.

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PROCEEDINGS  
OF THE  
ASIATIC SOCIETY OF BENGAL,

JUNE, 1847.

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The usual monthly meeting of the Asiatic Society was held on Wednesday evening, the 2d of June.

*Capt. WM. MUNRO, in the Chair.*

The minutes of proceedings of the last meeting were read and adopted, and the accounts and vouchers for May laid on the table as usual.

The following gentlemen having been duly proposed and seconded at the May meeting, were ballotted for and duly elected:—

R. O'Dowda, Esq.

Lieut. Thuillier, B. A.

J. B. Elliott, Esq. C. S.

H. W. Elliott, Esq. C. S.

Capt. Thos. Brodie, 5th N. I.

Lieut. Ed. Tuite Dalton, 9th N. I.

C. B. Skinner, Esq.

F. E. Hall, Esq.

J. Johnstone, Esq.

Mr. E. Currie of the Civil Service was named as a candidate for election, proposed by Mr. E. C. Samuells, seconded by Mr. Bushby.

Read letters—

From Major Sturt, Secretary to Government of India, Military Department, forwarding copy of a pamphlet by Professor Austed, entitled, "Facts and suggestions concerning the Economic Geology of India."

From Mr. Secretary Young, forwarding the annexed correspondence regarding the discovery of Cannel coal at Junk Ceylon.

(No. 461.)

*From the Under Secretary to the Government of Bengal,  
To the Secretary to the Asiatic Society,*

STEAM.

*Dated, Fort William, the 19th May, 1847.*

Letter from the Governor of P. W. Island, Singapore and Malacca, No. 31 of 27th February, 1847.

Ditto Mini Master of Calcutta No. 456, dated 30th ultimo, 1 Enclosure.

Ditto to Governor of P. W. Island Singapore and Malacca, No. 469, dated 19th inst.

SIR,—I am directed to transmit for the information of the Society a copy of the Correspondence noted in the margin regarding a specimen of Coal discovered in Junk Ceylon.

I have the honor to be, Sir,

Your most obedient servant,

A. R. YOUNG,

*Under-Secretary to the Government of Bengal.*

(No. 31.)

*From the Governor of P. W. Island, Singapore and Malacca,  
To C. BEADON, Esq., Under-Secretary to the Government of Bengal, Fort William. Dated, Singapore, 27th February, 1847.*

SIR,—My letter under date the 26th July 1845, No. 124, will have made the Hon'ble the Deputy Governor of Bengal acquainted with my belief that Coal was to be found in the vicinity of Penang, and although I failed at that time, in discovering the mineral, yet I did not relax my inquiries, and I am now enabled to report very satisfactorily on the subject.

On the recent return of the Hon'ble East India Company's Steamer Hooghly from the Northern end of the Straits, after conveying the Hon'ble Recorder, and Court Establishment to Penang, Captain Congalton brought me a specimen of Coal which had been deposited by some person at the Harbour Master's Office; search had been made for the party without avail, and I apprehended that I should be again baffled, when I was favored with a letter, regarding the said Coal, by the Resident Councillor at Penang, a copy of which I beg to enclose.

The Hon'ble the Deputy Governor will observe that the Coal now discovered, (a specimen of which I beg to forward for the purpose of being tested,) is found on the Southern Coast of the Island of Junk Ceylon, which is not far from the River Gurbie, on the Malayan Peninsula, where my former search was made, and if we may judge from the seam noticed by Kong Kiyon, who brought in the Coal, there must be a large quantity available.

I do not think that Kong Kiyon is competent to enter into the engagement proposed by the Resident Councillor at Penang, or that we should be justified in making any agreement with him to supply the mineral from the territory of our Ally, the King of Siam, without previously ascertaining



how far he may be cognizant of such a proceeding; neither would the price demanded, viz. 7 dollars per ton, justify me in laying in any quantity whilst that of ascertained good quality can be purchased for 6 dollars per ton.

I have however ventured to authorize Mr. Garling, to commission from Kong Kiyon two or three coyans of the Coal, and on delivery, to present him with 25 dollars from Government in addition to the price of the Coal, for having made the discovery known to the authorities, and with a view of inducing others to come forward with any information likely to develop the resources of these settlements, and the adjacent native states, which I trust will meet with the approval of the Hon'ble the Deputy Governor of Bengal.

The Junks from China and Cochin China are now daily making their appearance, and I am averse to withdrawing the Steamer from the vicinity of Point Romania for any lengthened period, or I would have furnished a more full Report on the subject of this Coal, but I hope to proceed on my annual tour early in May, or as soon as it shall be ascertained, by the change of the monsoon, that the whole of the Junks of the season have arrived, when I shall send the Hooghly to Junk Ceylon, and do myself the honor of reporting the result.

I have the honor to be, &c.

(Signed) W. J. BUTTERWORTH,

Governor.

*Singapore, 27th February, 1847.*

(No. 161 of 1847.)

*From the Resident Councillor Prince of Wales Island.*

*To the Hon'ble the Governor, &c. &c. &c.*

SIR,—Captain Congalton, in command of the Hon'ble Company's Steamer Hooghly, will have shown to you a muster of Coal brought to Penang just about the time the Steamer reached this port. He procured the muster from Mr. Gottlieb, the Harbour Master, but no particulars could be obtained, as the man who brought the sample could not be found. Mr. Gottlieb having at last succeeded in tracing the man, sent him to my office, and I have now the honor of giving you the result of my inquiries. The man's name is Kong Kiyon, a Siamese by community, but born in Penang. By his statement, the Sample was found on the river bank mingled with the mud, close upon the jungle, and about 2 or 3 hundred feet from the mouth of the river, on the Southern Coast of the Island of Junk Ceylon. There are rocks on the coast—Kong Kiyon went there to collect Ratans—any persons may there go into the jungles and collect what they please; sometime since he brought a piece of this mineral to Penang, but it was considered as useless. Having been spoken to on the subject, immediately he came upon this Coal as stated,



he set to cooking his rice with it, and finding it answer the purpose well, he ventured to bring away about 4 or 5 coyangs of it. The boat has now gone away and he has now left but one small piece, which he promised to bring to my office.

He discovered a stratum about 3 feet in thickness close under the surface, but of its length and breadth he knows nothing. Why the people do not use it for culinary purposes he knows not, but supposes that they may know nothing about it. There are no inhabitants in the vicinity of the Coal, and he entertains no difficulty in bringing away any quantity.

Kong Kiyon told Mr. Gottlieb that he would engage to bring the Coal at the rate of \$12 per coyang of 45 Pecuils. He has thought better of it. He tells me that, after consulting his comrades, he would not engage under \$150 for an 8 coyang boat load, being upwards of 50 per cent. beyond his offer to Mr. Gottlieb. But Kong Kiyon says, that for \$150 per load of an 8 coyang boat, he will enter into a bond with securities to supply the mineral always, provided a small advance of cash be made to him, as he has no funds of his own.

Mr. Gottlieb brought one piece burnt. It had the appearance and smell of a common cinder, only it was very light in weight. Captain Congalton spoke well of it after trial.

I shall await your instructions in this matter.

I have, &c.

(Signed) S. GARLING,  
*Resident Councillor.*

*P. W. Island, the 13th February, 1847.*

15th.—P. S. The specimen of Coal not having yet come to hand, I shall no longer detain this letter.

(Signed) S. GARLING,  
*Resident Councillor.*

(True Copy)

(Signed) W. J. BUTTERWORTH,  
*Governor.*

(No. 290.)

Copy of this letter and of its enclosure, together with the specimen of Coal otherwise received, forwarded to the Mint Master of Calcutta, for the purpose therein mentioned.

By order of the Hon'ble the Deputy Governor of Bengal.

(Signed) C. BEADON,  
*Under Secretary to the Governor of Bengal.*

*Fort William, 7th April, 1847.*

(No. 456 of 1846-47.)

*From Lieut.-Col. W. N. FORBES, Mint Master.*

*To C. BEADON, Esq. Under Secretary to the Government of Bengal.*

SIR,—I have the honor to acknowledge the receipt of your letter No. 290, dated the 7th April 1847, forwarding a copy of a letter and enclosures from the Governor of P. W. Island, Singapore and Malacca, together with the specimen of Coal which accompanied them, and in reply to state that, as the specimen supplied was insufficient for experiments conducted in the Steam Engine, or other mint furnaces, I requested Dr. W. B. O'Shaughnessy, Chemical Examiner to Government to examine it in detail, and I have now the pleasure of transmitting in original his very satisfactory report on its assay and analysis.

I have, &c.

(Signed) W. N. FORBES,

*Mint Master.*

*Calcutta Mint, the 20th April, 1847.*

(No. 26.)

*From Dr. W. B. O'SHAUGHNESSY, Chemical Examiner to Government,  
To Lieut.-Col. W. N. FORBES, Mint Master.*

*Dated, Chemical Examiner's Office, Fort William, 30th April, 1847.*

SIR,—In reply to your letter of the 14th inst. requesting me to furnish a report on a specimen of Coal received from the Government of Bengal, I have the honor to send you the accompanying memorandum of the results of its analysis, which shows that this Coal is by far the most valuable hitherto found in this or adjacent countries.

2. The coal is identical with the "Cannel" or "Wigan" kind. It is free from sulphur, cokes well and yields such an abundance of gaseous inflammable matter as to be of the utmost value for generating steam or manufacturing gas. The proportion of ash is moreover very small. The discovery of this kind of coal promises moreover to prove of additional importance in as much as it is generally found to accompany deposits of the richest and best ordinary coking coal.

3. The documents sent with your letter are herewith returned.

I have, &c.

(Signed) W. B. O'SHAUGHNESSY,

*Chemical Examiner.*

Memorandum of composition of specimen of Coal from Junk Ceylon, compared with that of English Cannel Coal.

	Specific gravity.	In 100 Parts.		
		Volatile matter.	Coke.	Ash.
Junk Ceylon Coal, . . . . .	1. 25	60.40	39.58	2.50
English Cannel Coal, . . . . .	1. 27 †	60.00*	40.00*	0.30†

(Signed) W. B. O'SHAUGHNESSY,  
Chemical Examiner.

Calcutta, 30th April, 1847.

\* Dr. Thomson.—Brande's Manual, pp. 9, 83.

† Berthier.—Traite des Essais, Vol. 1, pp. 328, 336 and 339.

(No. 469.)

*From the Under Secretary to the Government of Bengal,  
To the Governor of Prince of Wales' Island, Singapore and Malacca,  
Dated Fort William, the 19th May, 1847.*

SIR,—I am directed to transmit for your information copy of a letter from the Mint Master of Calcutta, No. 456, dated the 30th ultimo, with the Chemical Examiner's Report which accompanied it, on the specimen of Coal received with your letter No. 31, dated the 27th February last.

2. You will observe that the quantity forwarded by you was not sufficient for such experiments as are conducted in the Steam Engine and Mint Furnaces, and you are therefore requested to procure a larger supply of the same description of Coal. It is very desirable too that the locality in which it is found should be more accurately ascertained and described, and the Deputy Governor feels assured that you will use every effort to obtain the fullest particulars on this point as well as every other connected with this important subject.

I have, &c.

(Signed) A. R. YOUNG,

*Under-Secretary to the Government of Bengal.*

*Fort William, the 19th May, 1847.*

(True Copies.)

A. R. YOUNG,

*Under-Secretary to the Government of Bengal.*

From Captain James Abbott, giving further details on the manufacture of the Damasqued sword blades of Goojrat.

From Mr. Hodgson, forwarding a paper on the crestless Poreupine, *with plates.*

From the Rev. Mr. Mason ditto on the Gamboge tree of Tenasserim.

From Dr. Cantor ditto on the Reptiles of the Malayan peninsula and Islands.

From Mr. Piddington, presenting a chart of the hurricanes in the bay of Bengal.

From the Officiating Deputy Surveyor General, presenting the Meteorological Register for May.

From Mr. Hodgson, presenting a paper on various genera of the Ruminants, *with plates.*

From the Librarian, submitting the MS. of a popular catalogue of the curiosities in the Society's Museum, (referred to the Committee of Papers.)

From Mr. Blyth, applying for a supply of spirits of Wine for the Museum.

The purchase of 6 gallons monthly was sanctioned accordingly.

A memorandum was submitted from the Oriental Section, recommending the publication of Mr. Hodgson's Essays on the Bodo, Dhimál and Koeh dialects of the sub-Himalayan aborigines, to be published as a separate work, at the expense of the Oriental Fund.

Resolved that this proposition be referred to the Committee of Papers, it being doubtful whether the Oriental Fund can be employed for any but classical or ancient works.

On the proposition of the Secretaries, on the part of the Committee of Papers, a copy of Victor Jaquemont's Travels in India was directed to be purchased for the Library.

The following list was submitted by the Librarian :—

*Books received for the Meeting of Wednesday, the 2d June, 1847.*

PRESENTED.

The Chenchwars, a wild tribe inhabiting the forests of the Eastern Ghauts, by Captain Newbold.—BY THE AUTHOR.

The Gospel of St. Matthew, translated and printed in the Lepcha language, by the Rev. William Start, Missionary at Darjeeling.—BY THE AUTHOR.

Summary of the Geology of Southern India, by Captain Newbold.—By THE AUTHOR.

Annals of the Lyceum of Natural History of New York, Vol. IV. No. 5—7.—By THE SOCIETY.

Account of a Visit to the Bitter Lakes, Isthmus of Suez, by the bed of the ancient Canal of Nechos, the “*Khalej al kudim*” خليج القديم of the Arabs, in June 1842, by Captain Newbold.—By THE AUTHOR.

Description of the Wild Ass and Wolf of Tibet, with illustrations, by B. H. Hodgson, Esq.—By THE AUTHOR.

Catalogue of the specimens and drawings of Mammalia and birds of Nepal and Thibet, presented by B. H. Hodgson, Esq. to the British Museum. Two copies.—By B. H. HODGSON, Esq.

Proceedings of the Royal Society, No. 62 to 66.—By THE SOCIETY.

Proceedings of the Zoological Society of London, part XIII. 1845.—By THE SOCIETY.

Le Moniteur des Indes Orientales et Occidentales, No. II.—By THE EDITORS.

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the month of April, 1847.—By THE OFFICIATING DEPUTY SURVEYOR GENERAL.

Ditto ditto kept at Kyook Phyoo during April, 1847.—By THE SUPER-INTENDENT OF MARINE.

Address of the most noble the Marquis of Northampton, read at the anniversary meeting of the Royal Society, on November 30, 1846.—By THE ROYAL SOCIETY.

The Journal of the Royal Geographical Society of London, Vol. XVI. part II.—By THE SOCIETY.

Philosophical Transactions of the Royal Society of London, for the year 1846.—By THE SOCIETY.

Account of an Excursion in search of Ancient Inscriptions and other Relics in India, by a field officer of the Engineer corps.—By THE AUTHOR.

#### EXCHANGED.

Journal of the Agricultural and Horticultural Society of India, Vol. V. part IV.

#### PURCHASED.

The London, Edinburgh, and Dublin Philosophical Magazine, No. 200.

The Curators of the Museums presented their usual monthly Reports.

*Report of the Curator Museum of Economic Geology for May, 1847.*

I have been employed examining various matters in the departments under my charge during the past month, but some are not completed and others not worth reporting upon.

*Geology and Mineralogy.*

Dr. Spilsbury has sent us an additional supply of specimens of the ferruginous spherules described in my report of Sept. 1846, as possibly volcanic. I have put into a separate notice for the Journal the result of my examination of one of them, which appears to me to demonstrate that they have not been derived from organic bodies.

Col. Ouseley has sent us a further and an abundant supply of the remarkable fibrous limestone with impure chalk (for chalk it certainly is if we use the name without reference to the organic contents of the purer European chalks) described in my last, and both in a mineral and a geological point of view, it is highly interesting; the layer of matrix is in some specimens fully half an inch thick!

*Economic Geology.*

Major Jenkins has sent us from Assam a curious kind of beads held in much veneration by the Singphos. I have put it into the form of a short paper for the Journal, the examination I was able to make of the minute specimen we could afford to take, being about  $1\frac{1}{2}$  grain in weight, so as to preserve for the Museum these singular specimens for comparison. When we can obtain others a more complete analysis may be made and the question settled of whether they are artificial or natural productions. Dr. Spilsbury has sent us (Report of March, 1847) another, and this time a handsome specimen of the Copper Ore of Sahgurh\* which is really a very fine and promising one, being a pure green and steel-grey oxide, probably a silico-carbonate of Copper dispersed in spots and masses through a quartz matrix with very little iron and apparently no sulphur in combination. It is to be regretted that such a promising ore is not wrought, but the expense of carriage from such a spot would be a heavy charge even on the manufactured produce.

He sends also a bar of iron from Tendookhairic which, his note says "cannot be wrought for the copper," but the obstacle is not copper,

\* From Sowrage, Sahgurh Raja's present capital, 9 miles north of Dhumonee, and 32 miles south of Tehree.





1. *STEGOSTOMA CARINATUM*, n. sp. a. Portion of upper lateral ridge, nat. size.

b. Ditto, magnified. 2. *SCYLLIUM OCELLATUM*, (Gmelin.)



which by the way would be volatilised in the heat required to smelt iron, but the sulphuret of iron which it contains, and the only chance of producing passable iron from the ore would be (perhaps) careful roasting of it; an expense which it would not support; I say, perhaps, not having seen the ore, for pounding and washing might with some earthy iron ores answer and leave the pyrites behind. And from some of the more compact and metallic kinds roasting would not separate the sulphur. Col. Ouseley has forwarded us a brick and a fragment from the Rangurli temple of Sirgoojah but I have no farther notice of it than the name.

*Zoological Department.—Mr. Blyth's Report.*

The following are the donations which I have now the pleasure to acknowledge :—

1. From G. T. Lushington, Esq. of Almorah. A fine male of the Tibetan (slightly aberrant) Gazelle recently described by Mr. Hodgson by the name *Antilope (Procapra) picticaudata*, in XV, 334. I have had it mounted, and now exhibit it together with its female, presented on a former occasion by Dr. Campbell. On looking over the large collection of original drawings of animals, and of tracings of such, which I brought from England, I have been gratified to find a tracing of Pallas's figure of his *Ant. gutturosa*; from which I now feel satisfied that it is a distinct species from the *Gazella picticaudata*, however close the affinity in various respects: but I must be permitted to retain my expressed opinion that, until now, I could not have felt justified in considering them as distinct. *N. B.* The same bare places on the site of the sub-orbital sinuses are visible in the male specimen as in the female; as if a rudiment of such an organ had existed in the recent subject.

2. From Major Jenkins, Pol. Agent at Gowhatti—The skeleton of a Leopard, and skins of the *Bhaloo-soor* and of *Sciurus bicolor*; also the imperfect skin of a Pangolin.

3. From Capt. Rollo, 50th Madras N. I.—Specimens of the *Schizodactylus monstrosus*, and of its larva, preserved in spirit, from Vizagapatam.

4. From Major Ouseley, of Chota Nagpur—A skin and two perfect skeletons of male Gaours (*Bos gaurus*).

5. From Mr. Warden, of the Pilot service—A fine specimen of a Shark, being a second and new species of the genus *Stegostoma*, hitherto only represented by the 'Zebra Shark' of authors, No. XVIII of Russell's 'Fishes of the Coronandel coast.' It may be described as—

*St. carinatum*, nobis, (Pl. XXV, fig. 1). Structure typical. Remarkable for a series of ridges studded with enlarged scales (vide fig. 1, a), the most prominent of which commences abruptly on the vertex towards the occiput, and is conti-

nued over the spine and along the upper margin of the first dorsal fin, upon which it gradually diminishes till it disappears at the extremity of the fin; a similar ridge commences gradually behind the first dorsal, and in like manner ascends and gradually disappears towards the tip of the second dorsal fin: a strongly marked lateral ridge commences gradually, near and a little posterior to the abrupt commencement of the medial dorsal ridge, diverging from that slightly till it reaches as far as the posterior base of the first dorsal fin, then continuing parallel to the back, and expanding at the tail so as to merge and disappear among the scales of that organ, which are similarly enlarged: a second and less prominent lateral ridge appears about half-way down the side, scarcely traceable for some distance above and posterior to the pectoral fins; this continues parallel to the upper lateral ridge, and in like manner becomes diffused over and disappears upon the tail: lastly, another ridge appears a little behind the pectorals and is continued along the anterior margin of the ventrals; another again is continued along the anal fin; and there is a lateral ventral ridge, commencing gradually from near the posterior base of each ventral fin. All the scales are conspicuously carinated. The general colour is brown, spotted all over on the upper surface with moderately large but unequally-sized black spots, placed nearly in rows both longitudinally and transversely: these spots are smaller on the head, and disappear anteriorly to the eyes, being also comparatively indistinct on the two dorsal and the anal fins: the lower parts are spotless throughout. The spots and the ridges are exhibited in the accompanying plate, and also a portion of the upper lateral ridge (fig. 1, a), parallel to the commencement of the anterior dorsal fin, natural size, and the same magnified (*b*). Length of the specimen nearly 4 feet. The second figure in the plate represents an Australian species of true *Scyllium*, the *Squalus ocellatus* of Gmelin.

6. From our Librarian, Baboo Rajendralál Mitra,—The fresh laid egg of a Cassowary (*Cassuarius emeu*.)

7. From E. Lindstedt, Esq.—Some fine fresh specimens of sundry Snakes.

8. By R. W. G. Frith, Esq., I have been kindly permitted to select such specimens as were required for the museum of an extensive collection of mammalia and birds, chiefly procured in the vicinity of Malacca. The only species quite new to the museum are two birds—an *Accipiter*, which seems to be undescribed, and *Brachyurus ceruleus*, (Raffles, v. *Pitta gigas*, Tem.),—and one fish—*Osphronemus olfax*, Cuv. and Val., *Hist. Poiss.* VII, 282: but various other highly interesting specimens have also been selected, tending to complete our series of *Hyllobates lar*, *Presbytis obscurus* and *Pr. albocinereus*, (Desm.), *Galeopithecus Temminckii*, *Paradoxurus leucomystax* (apud Cantor),\* *Lutra (Aonyx) barang*, and *Rhizomys sumatrensis*, among mammalia:

\* I differ from Dr. C. in considering this species to be *P. leucomystax* of Gray, from recollection of the original specimen in the Zoological Society's Garden, upon which the name was founded.

and in the class of birds—*Picus (Campephilus) validus*, mas, *Batrachostomus auritus*, jun., *Eupetes macrocerus*, Tem., and various others of commoner occurrence, among which may be mentioned the common Indian *Corvus culminatus*, which, though abundant at Penang, I had never before seen from so far south as Malacca, but in previous collections from that locality only the *C. macrorhynchos*, Vieillot, a very distinct species of black Crow. Upon the whole, this collection has added some valuable specimens to the Museum.

The Hawk can be satisfactorily identified with neither of the two described species inhabiting the Malay countries, viz. *Accipiter solöensis*, (Horsf., v. *cuculoides*, Tem.), and *Acc. virgatus*, (Tem.), to which Mr. G. R. Gray refers the *Acc. besra*, Elliot, of India.\* I shall designate it

*Acc. nisoides*. Presumed female in mature plumage differing only from that of *Acc. nisus* (common to Europe and India), in its much inferior size, being smaller than the male of *Acc. nisus*; and in having the throat streakless white, excepting a narrow median dark line; the usual lateral lines occur, but not conspicuously, bordering the ear-coverts beneath, which are observable in various other species of Hawks, Eagle-Hawks, &c. Length of wing  $7\frac{1}{2}$  inches, of tail  $5\frac{1}{2}$ ; tarse  $1\frac{1}{4}$  inch; middle toe and claw  $1\frac{1}{2}$  in.

June 2d, 1847.

E. BLYTH.

The usual display of stuffed animals that had been set up during the past month was exhibited; and after commenting briefly on these, Mr. Blyth proceeded to call attention to the rich collection of *Quadrumana* now in the Museum, amounting to above 100 specimens, either set up on wire, or to be thus mounted as soon as the Society's taxidermists could be employed on them. This series of *Quadrumana* was, for the occasion, ranged round the meeting room, and the Curator proposed to exhibit, in like manner, the series of other orders of mammalia and birds at future meetings of the Society; remarking that, from the greatly over-crowded state of the glass-cases, visitors to the Museum could at present but very inadequately appreciate the wealth of the Society's collections in these two classes more particularly, a considerable proportion of the specimens being, of necessity, concealed from view when piled one upon another in the glazed cabinets.

The following additional Report refers to the Society's present collection of *Quadrumana*.

\* Mr. Jerdon, in opposing this identification, regards my *Acc. nisoides* as the true *Acc. virgatus*; and certainly the *besra* does not accord with the descriptions of *virgatus*. The adult female *besra* is exceedingly like that of *Astur trivirgatus* in its colouring and markings; but the male is much more slaty above, and has much more rufous on the under-parts, than I have seen in adult males of *A. trivirgatus*. I am far from being satisfied that *Acc. besra* and *Acc. virgatus* are identical.

*Supplementary Report of the Curator of the Zoological Department.*

I beg to present the following memorandum on the species of *Quadrumana* at present in the Society's Museum.

The species of *Primates*, Lin., divide into what may be termed the *Cheiro-poda* and *Cheiroptera*, the former of which comprehends the subjects of this Report. The group first subdivides into what may be designated the *Anthropida* and the *Lemuria*.

The *Anthropida* falls into two primary divisions, respectively peculiar to the Old World and to the New World. These are the *Catarhini* and *Platy-rhini* of M. Geoffroy St. Hilaire. The former, among other characteristic distinctions, have constantly but two false molars on each side of both jaws: the latter have, as invariably, three.

The *Catarhini* next fall in to three well marked sub-groups.—1. That comprising the Human genus and the three genera of Apes, which have sundry anatomical peculiarities in common.—2. That composed of the Baboons and ordinary Monkeys of the Old World, with a simple stomach, and which are furnished with cheek-pouches.—3. That consisting of those numerous long-tailed Monkeys of the Old World which have a sacculated stomach, and no cheek-pouches.

The general appellation of *Quadrumana* applies to all of the *Cheiropoda* excepting Man. Our collection contains the following specimens, commencing with the Apes.

*Troglodytes niger*, Geoffroy. Of the Chimpanzee, we have a stuffed young male, standing 22½ inches high, forwarded by Mr. A. Bartlett, of London.\*

*Pithecus*, Geoffroy. The Orang-utans. Five stuffed specimens, besides skeletons, of all ages, from very young to full grown. Firstly, we have the mounted skin (deprived of one hand and one foot, which are preserved in spirit in the museum of the Linnæan Society of London), of the celebrated large adult (but not old) male procured in Sumatra by Capt. Cornfoot, who presented it to the Society, and which is described by Dr. Clark Abel in the 15th Volume of the 'Asiatic Researches,' and further noticed by myself in Vol. X, p. 837, of the Society's Journal. Secondly, the mounted skin and skeleton of a female (of the race termed *P. morio* by Prof. Owen), which lived 12 years in Calcutta in the possession of J. Apear, Esq., who presented it when dead to the Society, and was informed that the animal was six months old at the time it fell into his possession. In this specimen the dentition had

\* The supposed *Troglodytes niger* of Capt. Begbie's 'Observations of the Natural History of the Malayan Peninsula,' reprinted by Mr. H. E. Strickland in *Ann. Mag. N. H.* 1846, p. 395, refers to *Hylobates lar*: Capt. B.'s *Pithecus lar* being, apparently, *H. agilis*.



just been completed, or rather the third or last true molars were cutting the gums at the epoch of the animal's death.\* Our three other specimens are young of different ages.

Of the genus *Hylobates*, or Gibbon, we have a particularly fine series of specimens, though, with one exception only, they are referrible to but two species.

The exception is the fine pale female of *H. leuciscus*, F. Cuv. described in XIII, 465, which I procured with some other Javanese specimens at auction.

Of the Hoolock (*H. hoolock*, Harlan), we have seven fine mounted specimens, exemplifying the variation to which this species (in common with other Gibbons) is subject; besides a very pale living adult female with dark cheeks, throat, and chest, and white frontal band as usual, presented by Capt. Tickell: all the others are mounted from fresh specimens, received chiefly from the Barrackpore menagerie; but another pale adult female was presented alive by Mr. Heatly. Of the considerable number of individuals which I have now examined of this species, the males have been, almost without exception, deep black, with the white frontal band more or less developed, both as regards extent and the purity of the white: in general, but not always, this band is divided in the middle; and rarely it is of a dark grey colour, not contrasting very strikingly with the black. Females seem never to be of a deep black, but vary from brownish-black to whitish-brown, devoid however in the latter instance of the fulvous tinge which is observable in pale specimens of *H. lar*. In general, they are paler on the crown, back, and outside of limbs, darker in front, and much darker on the cheeks and chin. They are of every intermediate shade to the extremes mentioned; and do not appear to alter in

\* This valuable specimen arrived at the Museum at a most unfortunate time, when I was just recovering from a severe illness, and was passing my convalescence at the house of a friend at some distance, unable to attend office. Upon hearing of its presentation, however, I lost no time in repairing to the Society's rooms, but reached them too late for any useful purpose, beyond that of superintending the setting up of the skin. When the animal was alive, I often saw her; and she appeared to be always mild and good-tempered. The adult female Orang-utan which Sr. Del' Casse exhibited some month's ago in Calcutta, was a much larger and more powerful beast, and had quite a different expression of countenance. She was also, on the whole, good-tempered, but uncertain and dangerous to handle, which prevented my taking her dimensions. I consider her to be of the race termed *Mias Rambi* by Mr. Brooke. A remarkable trait of this individual was her decided sense of *pudor*: however she might lie or roll about, she never failed to use one foot for purposes of concealment, holding therein a small piece of board generally, or in default of this a wisp of straw, or whatever she could seize on for the purpose. The general colour of Sr. Del'Casse's animal was very dark, with much blackish hair pendent on the sides of the face, and the whole face was dark, excepting the eyelids.

colour through life. The *H. choromandus* of Mr. Ogilby is founded on a Hoolock of intermediate hue, in the collection of the Zoological Society. I may add that we have three skeletons of Hoolocks of different ages, one only being as yet mounted.

Of *H. lar*, the common Gibbon of the Tenasserim provinces and Malayan peninsula, (replaced in Arracan, Sylhet, and Assam, by *H. hoolock*,) we have as many as twelve specimens of all ages and colouring; for seven of which, from Malacca, we are indebted to Mr. Frith and Mr. E. Linstedt.\* The whole of these, and eleven other Malacca specimens lately received by Mr. Frith, are more or less dark, varying from deep brown to brownish-black, with the back generally paler (more or less so), and sometimes variegated with whitish patches: occasionally the rump is whitish in dark individuals: and the hands and feet are fulvous-white, rarely much suffused with brown. The white ring surrounding the face varies a good deal in development; in one of our specimens being almost obsolete, except on the chin: and some again have much more white on the chin and throat than others. The only pale specimen of this Gibbon which we possess from Malacca, is a very young male that was presented alive by Mr. McClelland:† but in the Tenasserim provinces, the pale variety seems greatly to predominate (if not to the exclusion of the dark varieties, at least in some localities). The Rev. J. Barbe presented us with adults of both sexes, together with the new-born young, and one a little older, from Ye; all being of a fulvous-white colour, palest in the old male; and another Tenasserim adult female, received from the Barrackpore menagerie, is of the same light hue. It is remarkable that while Mr. Barbe's smallest Tenasserim specimen, about the size of a Marmoset, is densely clad with long hair throughout, one of the same size (but still younger) from Malacca, has the belly and inside of the thighs entirely nude of hair, the throat, breast, inside of arms, and outside of thighs, very scantily clad, and the pelage of the head and back is very much shorter and less dense than in the other; a greater difference than so slight a disparity of age seems sufficient to account for: indeed, our young pale specimen from Malacca, though considerably older than either, is much less densely clad than the infantile Tenasserim specimen.

Of the Monkeys with a simple stomach, and cheek-pouches, the largest and most highly typical are the African Baboons. We have only a young specimen of

\* Mr. Frith has since favored us with another skin of a mature female, remarkable for having a small supplementary nipple half an inch below the ordinary left nipple.

† This was brought to Calcutta by Capt. Charleton, who had also pale adults from Malacca, and informed me that the pale race (which he considered distinct) kept in separate flocks from the dark race. Dr. Cantor has also pale Malayan specimens.

*Cynocephalus porcarius*, (Boddaërt.) The common Cape Baboon, procured dead from a dealer.

The most nearly allied Asiatic species constitute the division *Papio* apud Ogilby, which name is however assigned by Mr. Gray to the African Mandrill and Drill. Acknowledging the group as Mr. Ogilby established it, it seems that *Inuus*, Geoffroy (applied by that naturalist to the Magot of Barbary), has the best claim to be retained as its appellation. Two minor groups are comprised, viz. the *Silenus* of Mr. Gray, from which surely cannot be separated *I. arctoides*, *I. nemestrinus*, and *I. niger*; while *I. rhesus* is more allied to *I. sylvanus*.\* The Society's present specimens are as follow:—

*I. silenus*, (L.) Very fine examples of the male and female; the former purchased (dead), the latter received from Barrackpore. Also a fine mounted skeleton of an adult male. This species of Monkey is stated by all authors to be indigenous to Ceylon; but I have the authority of Dr. R. Templeton of Colombo for stating that it does not inhabit that island, though tame specimens are often taken there. In Travancore and Cochin, it occurs abundantly in a state of nature.

*I. arctoides* (? Is. Geoff.): described, with a mark of doubt, as *I. nemestrinus* in XIII, 473. Adult male, and a young specimen, from Arracan; presented by Capt. Phayre.

*I. nemestrinus*, (L.) Nearly full grown male, purchased (dead); adult female, presented by Mr. E. Linstedt; and the Society possesses the skeleton of an adult male, and also a living male. Common in the Malayan peninsula, Sumatra, &c.

*I. rhesus*, (Lin.): *Pithex oinops*, Hodgson. Specimens of large adult male, and of female with young at the breast, procured in the Soonderbuns; also a younger adult male; and a huge and monstrously obese male, of which the carcass was picked up in the public street and brought to the Museum. Common in the Bengal Soonderbuns, Assam, &c.

The name *Macacus* should apply typically to the *Macaque* of Buffon, and various allied species which are scarcely (if at all) separable from the *Mangabays* of Africa, to which *M. carbonarius* especially approximates, with its dark face and pale eyelids.

*M. cynomolgus*, (Lin.) Adult male, purchased alive: female, from Malacca, presented by Mr. Frith; ditto, from Ye, presented by the Rev. J. Barbe; young, from the Nicobar Islands, presented by Capt. Lewis; ditto, from Timor, presented by Mr. W. Benson. Common in the Malay countries.

\* Of the whole of the species here mentioned (excepting *arctoides*), I am familiar with the living adults.

*M. carbonarius*, F. Cuv. Living adult male, purchased : young, presented by Capt. Abbott. Common in Arracan, and quite distinct from the preceding species.\*

*M. radiatus*, Desm. Living adult male ; and stuffed specimen of a nearly full grown female, purchased (dead). Common in the peninsula of India, and replaced in Ceylon by the allied *M. sinicus*.

Of the African genus *Cercopithecus*, we have only *C. sabæus*, (Lin.), v. *C. chrysurus*, nobis, XIII, 477. A large old specimen ; and a younger one, from the Cape de Verd Islands, purchased alive.

We now proceed to the division of long-tailed Monkeys, with a sacculated stomach, and devoid of cheek-pouches, comprising the Asiatic genus *Presbytis* (vel *Semnopithecus*), and the nearly allied African genus *Colobus*. Of the latter we possess no example ; but of the former a tolerably rich series.

*Pr. entellus*, (F. Cuv.). Adult male and female, and two young of different ages ; procured in the neighbourhood. We have also skeletons of adults of both sexes, not yet set up. This, the *true* Entellus Monkey, or common *Hoonuman* of Bengal, I have never yet seen wild on the eastern side of the river Hoogly, and its absence has often been remarked on the Cossimbazar island (formed by the two chief conflucuts of the Hoogly and the main stream of the Ganges) ; while it abounds almost everywhere on the western or right bank of the Hoogly and up the Ganges, extending its range to Central India, and to Cuttack. I am assured also of its occurrence in Assam ; but have never seen a specimen from that province. This animal is of a pale sullied straw-colour, more or less tinged with a peculiar *chocolat-au-lait* brown on the back and limbs ; having constantly black hands and feet, and no trace of crest on the vertex. It is one of the commonest of Bengal animals, and I have never observed it to vary, so as to approximate in any degree to the following species.

*Pr. priamus*, Elliot, XIII, 470. The common *Hoonuman* of the Coromandel coast and of Ceylon, and which Mr. Jerdon informs me abounds, together with *Pr. hypoleucos*, in the vicinity of Tellichery on the Malabar coast of the peninsula of India. A nearly full grown female, presented by Walter Elliot, Esq. In this species, the pale *chocolat-au-lait* tint spreads over the whole back and outside of the limbs, to a much greater extent than is ever seen on *Pr. entellus* ; appearing also upon the crown, which exhibits likewise a compressed high vertical crest, resembling that of several of the Malayan species ; and the hands and feet are whitish, *i. e.* clad above with whitish hairs. The hairs of the pelage of this and of the two following species are straight, and not sinuous as in *Pr. entellus*.

\* I have been keeping both alive for these two or three years past, adult males ; and have seen and had several other live specimens of *M. carbonarius*.

Of *Pr. anchises*, Elliot, XIII, 470, I can only exhibit a skin sent on loan by that gentleman. This is the common species of the elevated table-land of the peninsula of India; and is remarkable for the great length of its hair generally, that upon its toes imparting the appearance of a Spaniel's paw.

*Pr. hypoleucos*, nobis, X, 839, XII, 170, XIII, 470 : *Sennopithecus Dussumieri*, Schinz : *S. Johnii*, var., Martin. An adult male, from Travancore, presented by Dr. W. Coles of Madras. This species abounds along the range of the Malabar ghats. Vide Pl. XXVI, fig. 1.

*Pr. albocinereus*, (Desm). Adult male, nearly full grown female, and small young; presented by R. W. G. Frith, Esq. : mature female, presented by E. Lindstedt, Esq. All from Malacca. In the preceding members of this genus, constituting with others a subgroup peculiar to India proper, the hair of the crown radiates from a centre, a little behind the brows: in the present Malayan species, there are two such centres, placed laterally near together; and the hair of the occiput is somewhat lengthened and directed upwards, terminating at the vertical crest which it aids to produce. Colour dusky grey-brown above, more or less dark, with black hands and feet, and white under-parts and inside of limbs, as also great part of the haunch and thigh externally: crown generally blackish, with admixture of white in the two radiating centres; and the upward-directed occipital hair is concolorous with the back, or somewhat paler. Tail generally blackish except towards its base. The small young resemble the adults, except in having a well-defined pale greyish band on each side, separating the dusky hue of the back from the white of the under-parts, and terminating in the white haunch. In this species, the eye-lids appear to form the only white portion of the face, the skin of the lips being dark.

*Pr. Phayrei*, nobis: referred to *Pr. obscurus* in XIII, 466, where described. Skin of an adult, presented by Capt. Phayre: two specimens of the young, presented alive by Capt. Abbot. Common in Arracan. This much resembles the preceding species in its colouring, but differs from it in many particulars. There are no radiating centres on the crown; but a much longer and less dense, thin and compressed, vertical crest: the occipital hair is not lengthened, and is directed downwards: the white of the under-parts scarcely extends upon the inside of the limbs, and spreads much less on the sides, which are dark like the back; and the haunches and thighs are uniformly coloured with the back: the whiskers also are dark, and very long, concealing the ears in front; whereas in *Pr. albocinereus* the ears are wholly visible: lastly, the tail is generally more or less albescent to near its tip; and the lips are conspicuously white, and well furnished with white moustachial hairs above, and similar hairs below. Vide Pl. XXVI, fig. 3.



*Pr. Barbei* (?), nobis, n. s. ? Adult male and female, from the Tenasserim province of Ye; presented by the Rev. J. Barbe. Intermediate to the preceding species and to *Pr. obscurus*; but seemingly, distinct from both. There is no vertical crest, as in the former; nor is the occipital hair lengthened and conspicuously much paler, as invariably in the latter species: but the shoulders and outside of the arm are silvered in both specimen; and the under-parts resemble those of *Pr. obscurus*. The tail is very slightly paler than the body; whereas in twelve adults of *Pr. obscurus* (lying together before me, at the time of drawing up this description), the tail is in every one much paler than the body. The size of the full grown animal is also considerably inferior to that of *Pr. obscurus*, and perhaps a little exceeds that of *Pr. Phayrei*. In the female specimen, there is a white space at the interior base of the thigh, more developed on one side than on the other. The pale markings of the face resemble those of *Pr. obscurus*. If a variety of either, however, (which I suspect it is not,) it should rather be referred to *Pr. Phayrei*.

*Pr. obscurus*, (Reid.) Adult male and female, newly born young, and one a little older; presented by R. W. G. Frith, Esq: half grown male, and newly born young; presented by E. Lindstedt, Esq. All from Malacca. Of the three very small specimens, the youngest is entirely of a bright light fulvous hue, without any admixture of dark hairs: the second has a general slight admixture of dark hairs, which predominate on the forehead, vertex, and occiput, while the sincipita continue bright fulvous; the arms and hands, knees, shins, and feet, are as dark as in the adult: the third, but very little larger, is coloured as in the mature animal, except that the terminal three-fourths of its tail continue rufous; and some admixture of the same remains on the sincipita, throat, flanks, and exterior of thighs. In the half-grown specimen, an extremely faint vestige of this rufous is still traceable upon the tail only.

*Pr. Johnii*, (Fischer:) *Semnopithecus cucullatus*, Is. Geoffroy. Adult male, received dead from Barrackpore: and a female, from the Nilgherries, with very long hair on the head; presented by T. C. Jerdon, Esq.

*Pr. cephalopterus*, (Zimmerman, with numerous synonymes.) Full grown female, purchased alive: adult male, of a brown variety (not in very good order), from Ceylon; presented by T. C. Jerdon, Esq.

\* No trace, at least, is visible on either of the two dry specimens: but the taxidermist lad who prepared them asserts, very positively, that they had a thin raised crest upon the vertex, when fresh: and also that a young one was obtained alive, when the female was shot, of a pale rufous colour when of the size of the Society's two young specimens of *Ph. Phayrei*, which do not differ in colour from the adult animal.



*Pr. pileatus*, nobis, XII, 174, XIII, 467. Adult male and female, from the interior of the Chittagong hills; presented by the Rev. J. Barbe: another adult male, from the Tipperah hills; presented by F. Skipwith, Esq.; and a female, from the Barrackpore menagerie. The males of this species seem always to be of a deep rust-colour on the cheeks, lower-parts, and more or less on the outer side of the legs; while in the females this rust-colour is dilute and weak. Pl. XXVI, fig. 2.

*Pr. maurus*, (Lin.) Adult male, purchased dead. Inhabits Java.

Of the great series of South American Monkeys, constituting the *Platyrrhini* of M. Geoffroy, we have only two specimens at present:—

*Callithrix sciureus*, (Lin.): and

*Jacchus vulgaris*, Geoffroy; *Simia jacchus*, Lin. Both inhabitants of Brazil, and presented by Mr. Bartlett.

Of the *Lemuria*, or *Strepsirhini* of M. Geoffroy, comprising the two families *Lemuridae* and *Galeopitheciidae*, the following species of *Lemuridae*.

*Lemur mococo*, Lin. (Old collection). Inhabits Madagascar.

*Nycticebus taylori*, (Lin., apud Rafles.) Three marked varieties, and a fourth which is perhaps distinct.—1. Javanese variety, *N. javanicus*, Geoff. Specimen from Java, presented by the Batavian Society. Colour fulvescent. Two strongly marked and defined dark bands, ascending from around the eyes, meet at the occiput, where another equally defined band crosses them from ear to ear: the united occipital band is continued along the back, and becomes gradually evanescent towards the short tail.—2. Malacca variety. Equally fulvescent with the last; but the white, ascending from between the eyes, in general much diminished in quantity: around the eyes dark; but no defined bands ascending therefrom, the summit of the head being of a uniform diffused rust-colour, in which the markings of the preceding variety may sometimes be faintly traced: the occipital and dorsal stripe sometimes well developed, not unfrequently indistinct. Three specimens; two presented by the Rev. F. J. Lindstedt, one having the dorsal band well defined, the other indistinct; the third, with indistinct facial markings as in the preceding variety, presented by R. W. G. Frith, Esq.—3. Bengal, Assam, Sylhet, and Arracan variety. In general much paler than the others, occasionally almost white: the ears and around the eyes dark, but rarely a trace of the frontal and occipital bands; the glabellar streak, between the eyes, white and distinct; the frontal region uniformly albescens: specimen from Goalpara, presented by Dr. Thorburn: another, from Arracan, presented by Capt. Phayre: and a female and young from Tipperah, presented alive by F. Skipwith, Esq. This female is prepared as a skeleton.—4. Very deep-coloured variety (?), with remarkably short limbs; locality unknown. From the Society's old collection.

*Loris gracilis*, Geoffroy. Two specimens, presented by W. Elliot, Esq.; also a skeleton. Inhabits the Coromandel coast and Ceylon. A third mounted specimen was received from the Calcutta Medical College, stuffed: its locality being unknown. It is probably a distinct species; the ears are much larger and broader than usual, though apparently somewhat stretched; and the limbs are much less elongated. The skull of this specimen and that of *Nycticebus tardigradus* var. 4, have been taken out, and are now in the Museum; the specimens also have been re-stuffed, and their limb-bones examined: both were fully mature animals, the skulls presenting no peculiar distinctive characters; but the fore-arm of *Loris gracilis* var. (?) measures but  $2\frac{5}{8}$  inch, instead of fully 3 inches.

Of *Galeopithecida*, we have—

*Galeopithecus Temminckii*, Waterhouse. Four Malacca specimens, of different ages, presented by C. Hufnagle, Esq., R. W. G. Frith, Esq., and the Rev. F. J. Lindstedt.

Such is our present collection of *Quadrumana*: and I think I am entitled to add, that only the following specimens existed at the time of my taking charge of the Society's Museum.—1. The Orang-utan skin presented by Capt. Cornfoot, since mounted on wire. 2 and 3. Half grown specimens of *Hylobates hoolock* and *H. lar*, since replaced by better ones. 4. *Presbytis entellus*, half-grown, and since replaced. 5. *Cercopithecus sabæus*, since re-stuffed, and the skull taken out and cleaved. 6. *Lemur mococo*. 7. *Nycticebus tardigradus*, var. 4. Also the skeleton of an adult female small Orang-utau (imperfect), presented by Mr. Frith; skull of large male do; and skeleton of the *Semnopithecus maurus* apud Helfer, which is probably *Presbytis Barbei*. With a larger establishment, I should by this time have had a much more extensive collection of mounted skeletons.

The following are our chief Asiatic desiderata in this order, confining our attention to India and the countries adjacent.

From India proper, we require good series of all the different Monkeys that have been confounded under *Presbytis entellus*. Such are—*Pr. schistaceus* of the Himalaya, *Pr. anchises*, *Pr. priamus*, and *Pr. hypoleucos*. In fact, specimens of *Hoonumans* or *Lungoors* from any distant part of the country are extremely acceptable, as illustrating the precise distribution of the several species, and perhaps adding to their number.

We also require the *Inuus assamensis*, and *I. pelops* (the hill representative of *I. rhesus*), and the *Macacus sinicus* from Ceylon.

From Arracan, fine adults of *Presbytis Phayrei*; and from the Teuasserim provinces a living specimen of *Pr. Barbei*. Also good specimens, and living (if possible), of *Inuus arctoides*. From the Malayau peninsula and islands,

additional species of *Hylobates* and *Presbytis*, as especially *H. agilis*, *Pr. cristatus*, and *Pr. femoralis*, obtained in the peninsula by Dr. Cantor. Also the genus *Tarsius*: and, of course, any novelties that may yet be discovered in these countries: the Tenasserim provinces, more especially, having hitherto been very inadequately explored.

E. BLYTH.

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For all contributions and donations as above detailed, the thanks of the Society were directed to be conveyed in the usual manner.

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ERRATUM.—We are requested to state that the designation of M. E. Gibelin, recently elected a member of the Asiatic Society, is *Procureur General*, not *Procureur du Roi*, which is an inferior office.—EDS.

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*Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of June, 1847.*

Days of the Month.	Maximum Pressure observed at 9h 50m.						Minimum Pressure observed at 4 p. m.						Rain Gauges. Elevation. Feet Upper 40 Lower Inch	Moon's phases.
	Barometer re- duced to 32° Fah- renheit.	Temperature.		Wind.	Aspect of the Sky.	Barometer re- duced to 32° Fahrenheit.	Of the Mer- cury.	Temperature.		Wind.	Aspect of the Sky.	Maximum Temperature.		
		Of the Air.	Of Wet Bulb.					Of the Air.	Of Wet Bulb.					
1	29.540	90.0	88.0	82.9 W.	Cirrostrati.	29.428	95.2	93.0	82.5 S.		Cumulo strati.	96.0	0.29	0.38
2	550	91.0	89.9	82.6 S.	Cirrostrati.	465	96.5	95.0	83.5 S.		Cumulo strati.	96.6	0.39	0.47
3	562	88.0	86.4	81.3 SW.	Cloudy.	506	88.0	86.8	81.4 S.		Cumuli.	89.2	0.16	0.23
4	567	90.0	89.0	83.3 S.	Cloudy.	480	97.9	95.4	85.5 S.		Cumulo strati.	97.8	1.72	1.80
5	519	89.0	88.8	82.0 W.SW.	Cloudy.	466	91.0	90.0	85.0 S.		Cloudy.	92.0	..	..
6	548	85.5	85.0	79.0 S.	Cloudy.	463	89.0	88.4	81.5 S.		Cloudy.	92.2	..	..
7	559	92.0	90.6	81.0 W.SW.	Light Hazes.	490	92.0	90.0	83.0 E.		Cloudy.	95.1	0.05	0.11
8	615	80.0	81.0	77.9 S. E.	Overcast.	499	92.3	90.8	81.3 W.		Haze.	92.8	0.04	0.10
9	515	94.0	91.8	84.6 S.	Clear.	405	96.5	94.3	86.2 N. W.		Cloudy.	98.8	0.12	0.18
10	498	92.5	90.0	84.0 E.	Cumuli.	413	89.5	87.7	82.0 E.		Cloudy.	98.2	..	..
11	555	92.7	89.3	82.2 S. E.	Cumuli.	485	86.5	86.0	80.5 E.		Cirro strati.	96.0	..	..
12	541	86.3	86.0	82.0 N. E.	Cloudy.	432	88.6	87.0	80.1 S. E.		Cloudy.	90.8	0.31	0.35
13	549	88.0	87.0	83.0 S.	Cloudy.	479	86.8	86.8	81.4 S. W.		Cloudy.	91.0	1.04	1.12
14	596	79.5	80.5	79.0 S.	Drizzly.	497	87.4	87.0	82.0 S.		Cloudy.	87.8	1.83	1.98
15	600	87.0	86.4	82.2 S.	Cumuli.	522	90.0	89.0	83.0 S.		Cumuli.	91.0	1.95	2.30
16	660	83.0	84.5	81.4 S. W.	Cloudy.	584	87.0	87.0	80.0 S.		Cloudy.	88.6	..	..
17	647	89.0	88.5	81.3 S.	Cumuli.	572	90.0	89.0	81.0 S.		Cirro strati.	92.3	..	..
18	623	88.8	88.1	82.0 S. W.	Cumulo strati.	504	90.5	89.8	80.8 S.		Cumuli.	92.0	..	..
19	586	88.8	88.2	81.5 S. (high)	Cloudy Cirro-Cumuli.	477	91.5	90.5	83.0 S.		Cumuli.	93.5	..	..
20	587	89.0	88.5	82.0 S.	Cloudy.	504	82.4	81.5	77.8 S.		Very cloudy, thunder- ing.	93.4	0.10	0.17
21	570	90.0	87.8	82.8 S.	Cirro Cumuli.	483	90.0	88.0	81.5 N. E.		Cloudy, thundering.	95.3	..	..
22	603	92.0	90.0	83.0 S. E.	Cumulo strati.	518	86.0	85.0	80.3 S.		Cloudy.	91.8	0.37	0.45
23	637	85.2	86.0	81.0 E.	Cloudy.	554	86.0	85.3	81.0 S. E.		Cloudy.	88.9	0.66	0.73
24	..	..	..	..	....	..	..	..	..		....	86.5	0.33	0.42
25	673	88.4	85.0	83.0 S. E.	Cloudy.	577	82.0	80.8	78.9 E.		Rain, thundering.	91.0	0.24	0.33
26	647	90.4	87.8	81.2 S. E.	Cumulo strati.	535	88.9	88.2	81.0 S.		Cirro strati.	92.3	..	..
27	638	91.0	89.0	81.8 S. E.	Cumulo strati.	532	91.7	90.5	81.8 E.		Cumulo strati.	93.0	0.55	0.63
28	590	90.0	88.0	80.8 S. E.	Cumulo strati.	488	90.4	89.5	82.5 E.		Cloudy.	93.0	..	..
29	536	89.5	87.0	82.0 S. E.	Cloudy.	463	89.0	85.5	78.5 S. E.		Nimb.	92.0	0.05	0.10
30	597	92.5	89.0	81.4 S. E.	Cloudy.	510	90.9	88.8	82.0 S. E.		Cloudy.	90.7	0.08	0.16
Mean	29.585	89.1	87.5	81.8		29.494	90.1	88.5	81.7			92.7	10.28	12.01







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